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Original Communications.

WHY MEASUREMENTS OF THE MANDIBLE, TRACINGS OF THE CONDYLES, THE CONSTRUCTION OF HYPOTHETICAL TRIANGLES, AND THE USE OF THE FACE-BOW, ARE ALL NON-ESSENTIAL TO THE CONSTRUCTION OF FULL DENTURES POSSESSING THE HIGHEST DEGREE OF EFFICIENCY.

By Dayton Dunbar Campbell, D. D. S., Kansas City, Mo.

(Read before the National Dental Association at Its Twenty-First Annual Session, New York City, N. Y., October 23-26, 1917.)

IN THIS attempt to show that and "*why* measurements of the mandible, tracings of the condyles, the construction of hypothetical triangles, and the use of the face-bow, are all non-essential to the construction of full dentures possessing the highest degree of efficiency," the writer does not seek to minimize in the least the splendid achievements and practical contributions to the development of Plate Prosthesis, which have been made by dentists who have originated and have used or are today using articulators that employ any or all of these non-essential features. On the contrary, the writer believes that these men themselves have made imperative this further advance which he is able to bring to your attention—an advance which is *imperative*, not from a desire to support some theoretical contention but as a result of experiences gained in actual practice. Unless the proposed elimination of measurements, tracings, and face-bow is eminently practical and at the same time productive of the highest efficiency (thus far

obtained), this paper is unworthy of your consideration.

Some of my hearers may recall that my Rochester paper was a warm advocacy of the Gysi Adaptable Articulator. It is perhaps fitting to say that I had learned its use and had constructed dentures under the supervision of and had received words of commendation from Dr. Gysi, himself; that for a year I employed his methods and Adaptable Articulator exclusively in a practice limited to Prosthetics, besides teaching and demonstrating its principles before dental students and various district and state societies. I am indebted to Dr. Gysi, perhaps more than to any other, for my desire and inspiration to produce faultless dentures.

A chance incident in connection with the use and exposition of the Gysi Adaptable Articulator first demonstrated conclusively certain superfluous factors, and later reflections and experiences, together with an intimate association with Dr. Rupert E. Hall, of Houston, Texas, now of Chicago, led to the elimination of others. On this occasion to which I have just referred, the degree of inclination of the four condyle paths together with the location of the two rotation points for the articulator had been registered and noted before we were called away. Returning from lunch, we proceeded with the case thinking that we had already adapted the articulator to the individual registered movements. The case was tried in, to the satisfaction and admiration of those interested in the mandibular gyrations supposed to have been recorded. To me, a Gysi enthusiast, it was disheartening indeed, to learn a few minutes later, that the successful case had been constructed for this patient according to the widely variant individual registered movements of a previous patient.

This was one case in which "measurements of the mandible, and tracings of the condyles" were non-essential after this experience. I never used the Adaptable in my practice; the Simplex with its fixed rotation points and average condyle paths answered my every purpose.

Many of my hearers will have long since observed that they have never found measurements and tracings and hypothetical triangles, et cetera, essential. *Why* have they not found them essential? The writer states in one sentence *why* they have not: *It is because the tactile sense of the tooth cusp is the guiding factor in movements of the mandible.*

To Prosthetists this is a Copernican reversal, for whereas artificial dentures have previously been constructed to harmonize with the varied movements habitual to the individual patient, dentures are now constructed in conformity with the principles outlined for us by Orthodontists while the mandibular movements of the patient are consequently determined by the constructed dentures. Dr. Rupert E. Hall is the Copernicus of modern Prosthesis.

Orthodontists, years ago, exploded the theory that the cam-like movements of the condyle upon the eminentia articularis affected the alignment and relationship of the teeth in the arches. Movements of the mandible are of no importance either to Orthodontist or Prosthetist until opposing cusps are found in contact. When in contact, however, the relation of the inclined planes of the antagonizing teeth is of first importance both to Orthodontist and Prosthetist, and the latter has the advantage of arbitrarily determining this relationship. The fundamental question for the Prosthetist is then, what angle and corresponding over-bite will afford the most effective mechanical apparatus to perform a physiological function?

To develop graphically the thesis that the condyle paths are determined by the tactile sense of the tooth cusps from their initial contact to final tritu-

rating movement, this schematic model, suggested by Dr. Martin Dewey, of Chicago, is submitted. (Figure No. 1.) The three supports on each side may be considered favorably to represent the spheno-mandibular, capsular and stylo-mandibular ligaments. The power supplied by the muscles of mastication is here furnished by the operator. The extent to which the mandible can move is limited by the length of the ligaments. An imaginary extension of the spheno-

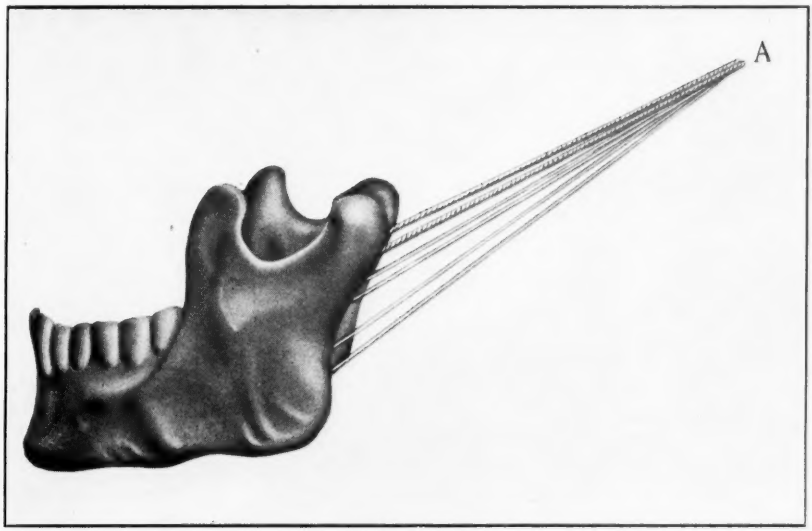


Figure 1.

mandibular and stylo-mandibular ligaments would cross at point A somewhere near the region of the superior curved line of the occipital bone which would serve as an imaginary rotation point. This imaginary point is incorporated in the Hall articulator which more closely imitates movements of the mandible than is possible in those articulators which depend on the condyles as rotation centers. The direction of its movements within these limits is wholly undetermined and wholly unimportant until the moment when antagonizing surfaces touch. The direction which this movement takes after contact, in the case of artificial dentures will have been arbitrarily and previously determined in the laboratory. And any-shaped condyle, glenoid fossa, or articular eminence will begin readily to adapt itself according to the new influences now active. Therefore the condyles do not describe true paths but travel, so to speak, in the wake of the cusp path.

The writer of this paper recalls that his most spectacular successes while using the Gysi Adaptable Articulator, were those in which excessive grinding had unwittingly produced a harmonious flange and groove relationship. At that time he was constrained to believe this result was the ear-mark of a true condyle path, but which he now properly designates as a cusp path.

The face-bow has been regarded as the dentist's calipers for maintaining upon the articulator the relations of the occlusal plane and the perpendicular of the triangle. The original reason for

establishing an occlusal plane was to furnish a starting point for operations and deductions which are altogether superfluous in the construction of artificial dentures. That the preservation of the perpendicular is immaterial, I shall now show. Schematic drawings and photographs of an articulator like this one (Figure 2) are familiar to all of us. The casts are mounted at A disregarding the face-bow and when the finished dentures are placed in the mouth at B the posterior teeth touch first as indicated. This is a correct illustration since this particular articulator is not capable of maintaining the proper relationship of the casts.

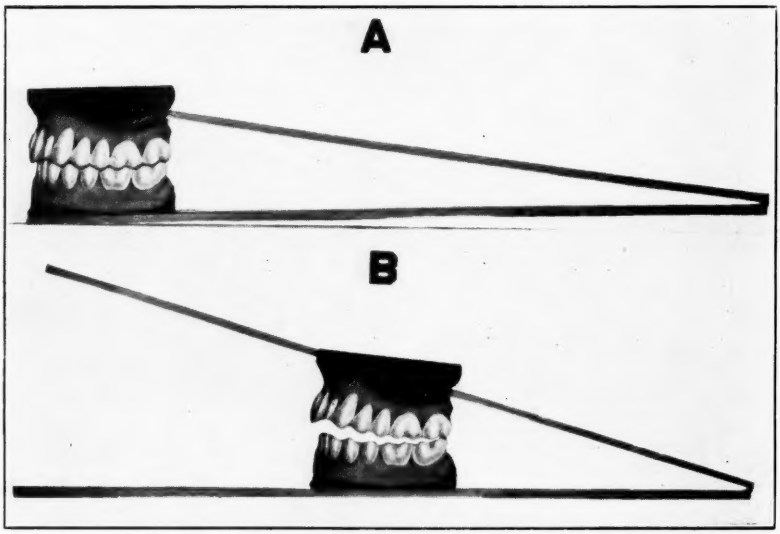


Figure 2.

When the casts are mounted on this heroic model articulator (Figure No. 3) at point B two units from the opening center, the teeth are in perfect occlusion as they would appear in the mouth. When mounted at point C, one unit from the opening center, the perpendicular of the triangle is perceptibly shorter, yet you will note that there is no change in the occlusion. We mount the casts at point A, three units from the opening center, thus greatly lengthening the perpendicular (the perpendiculars were usually very long until the manufacturers provided the guide-pin in front) but even now the occlusion remains unaltered.

The strongest recommendation of the face-bow has been that it enabled the operator to open or close the bite. Or, in other words, to enable the dentist to correct an error which could have been avoided thru the use of a proper technic. This proper technic consists in maintaining a constant correct relationship between the upper and lower jaws—and when correctly obtained there is no occasion to open or close the bite. The occlusion models, or bite-plates, are constructed from unyielding base plate and hard wax. The upper alone is placed in the mouth and the lip-line indicated. A section of wax large enough to admit three teeth on either side of the median line is cut out bodily

(Figure 4). These three are waxed into place, maintaining the lip-line; the wax is similarly removed from the opposite side and the three remaining anteriors the median line equal to the incisors and cuspids. A lower central incisor (Figure 6) is now waxed firmly in position, duly regarding its length with reference

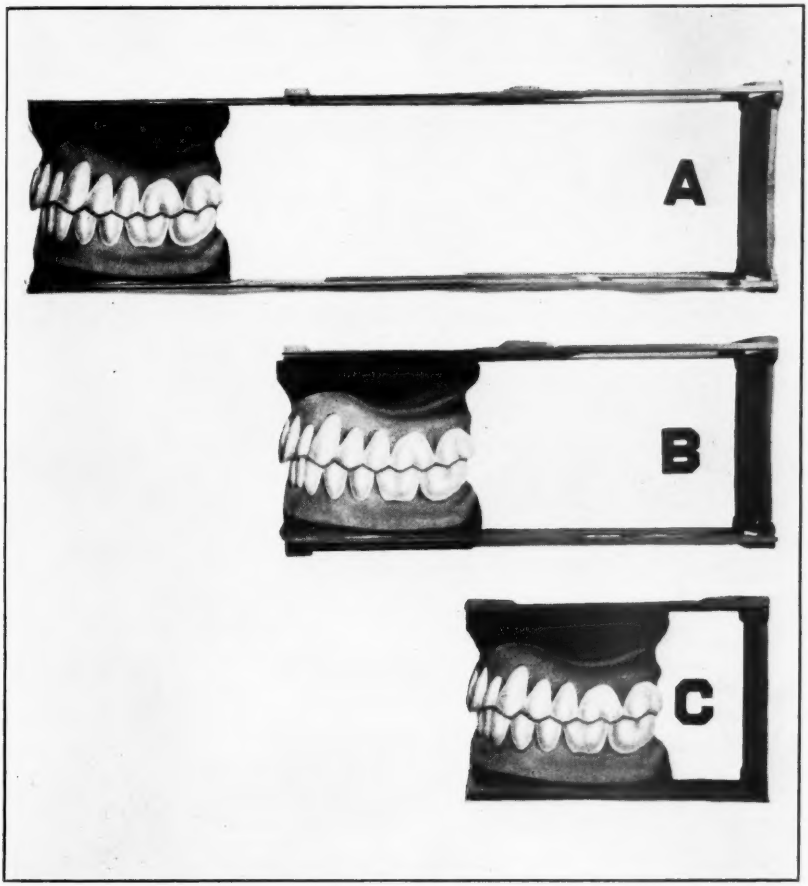


Figure 3.

inserted (Figure 5); the esthetic relation of the teeth and lips is noted, after which the plate is removed. The lower is now placed into position; the wax is trimmed to meet the needs of the lower lip-line, and the wax removed down to the base-plate a distance on each side of to the lip-and-median-line. Removing the lower, the upper base-plate is returned to position preparatory to taking the bite. With a sizzling hot spatula the remaining wax of the lower—with the exception of the confining borders—is melted thru to the base until it is a

veritable pool of wax. As soon as the wax is sufficiently congealed, the lower is

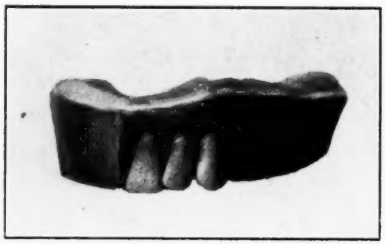


Figure 4.

placed in the mouth (Figures 7 and 7-A); with the index finger of each

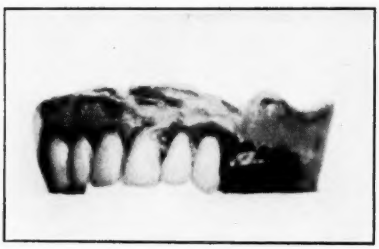


Figure 5.

hand the operator presses it into position upon the mucosa, and requests the

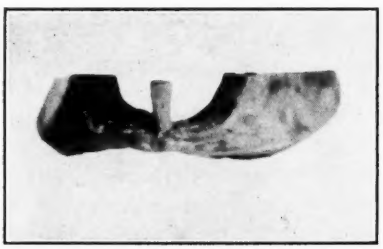


Figure 6.

patient to place the tip of the tongue against the posterior border of the upper and close. At the moment of closing, the operator brings such heavy pressure to bear against the ridge on both sides

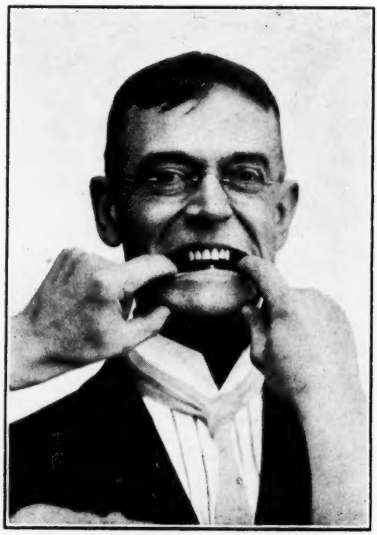


Figure 7.

that the patient's jaw recedes into proper position. (Figure 8).

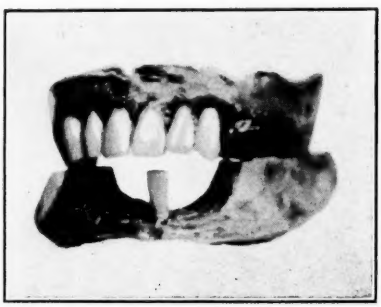


Figure 7-A.

Figure 9 shows the position of the lips slightly closed as they should be—allowing a normal relation of lips when

Figure 8.

the jaw is at rest, i. e., when the teeth are slightly apart.

Figure 9.

Fig. No. 10 bears the imprint of the upper occlusion model making it unnec-

Figure 10.

essary to mark, seal or staple them. When properly chilled they may be reassembled correctly.

Discussion.

Dr. George Wood Clapp, of New York City.

Mythology tells the story of a highwayman named Procrustes who kept a lodging house with only one bed. He had a rude sense of the fitness of things, and when he captured a traveler, he fitted him to the bed. If the traveler were too short to fill the bed, Procrustes stretched him. If he were too long, so that his feet stuck out, Procrustes sawed the feet off. This story has lived thru the ages, not because Procrustes lived or did these things, but because he is the world's great example of the man who tackles his problem wrong end to—who seeks to get results by fitting the wrong thing.

Procrustes may have been a dentist. At least, when I began practice, his shadow lay heavy across prosthetic procedure. In those days, we fitted edentulous patients to dentures. We took open-mouth plaster impressions and mash bites, and used plain line articu-

lators. The more careful among us fitted the teeth to the bench top by pressing them on the bench until all the cusps touched at once. After inserting the plates, we spent a variable period in trimming, grinding and explaining. If, at the end of that period, the patient had learned to wear the plates with reasonable comfort, the case was pronounced a success. If the patient had not learned, we either made excuses based on some physical unsuitability of the patient, or re-made the plate by the same methods. The failures were much more numerous than the successes. Comparatively few of the dentures were both comfortable and stable in position. Still fewer were efficient in mastication, and practically none were natural in appearance.

With the improvement in technic in operative work, and the more uniform degree of success which resulted, the more conscientious dentists were gradually won away from the prosthetic field in which such antiquated methods held sway, and plate-work was left largely to the conscienceless and incompetent, with the result that it has fallen into a deplorable condition.

Among those minds which rebelled at the Procrustean methods, a few of the stronger, realizing our obligation to edentulous patients, and that this service would totally fail unless the procedure were corrected, began inquiries as to what was wrong, and how it should be corrected. The names of some of these men are household words with us: Balkwill, Bonwill, Walker, Christensen, Snow, Gritman, Bennet, Breuer, Gysi, Williams, Green and others. They perceived from the beginning that the method of fitting patients to dentures was wrong, and that the logical thing to do, and the thing we had to do if we were to remain a profession, was to fit dentures to patients. And one may describe every one of their activities by saying that they sought the conditions to which the dentures should be fitted, and how to accomplish that fitting. Because of what these men have done, and only because of what they have done, it is today possible to make upper and lower dentures for any normal case, in which both plates have what we call "suction;" so that they are so stable in all positions of the mouth that the patients can crush

Figure 1.

This shows the face bow on the face. It is used as a means of transferring the models to the articulator in correct relations to the moving joint.

the hardest foods with the jaws wide apart, which are so efficient that the patient reaches in two or three weeks an efficiency in mastication heretofore unknown, and which are so natural in appearance as to often escape detection as artificial. There is no occasion for apologies to patients. Trimming is confined to a spot here and there, and grinding is unnecessary. Making over dentures is practically unknown.

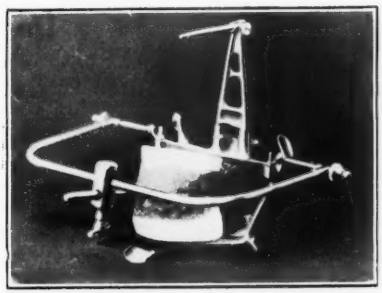
The time allotted to me is too short to permit me to answer in detail all the challenges in the title of this paper, and

I shall confine myself to answering what I understand to be the principle underlying the essayist's technic and his essay. If I understand him correctly, he says in effect that a certain form of denture has been perfected to which every patient can be fitted with the assurance of comfort in use and efficiency in mastication. With all due respect to the essayist, who is a personal friend, I shall try to show that in the light of our denture-making history and of present day accomplishments, this is old Dr. Procrustes with a new face, and I want to use his own statements, at least in part, to show that such is the case. Then I want to show you six lantern slides to prove my contentions.

Dr. Campbell says that the articulation of the teeth is the determining factor in the movements of the jaw in mastication. This is not a new statement, since Gysi and I made it in 1914. It is so true as to disprove, to my mind, even the principle of the essayist's contention.

If all the teeth of any given patient were in perfect position in the tooth rows, and the patient chewed equally on the two sides, and all the teeth were lost at once anywhere between the ages of 18 and 40, it is probable that the movements of that edentulous jaw would be so closely alike on the two sides that any fixed articulator, having correctly placed rotation points, would be satisfactory in arranging the teeth. Comparatively few people lose all the teeth at one time. They usually lose a tooth here and there, perhaps at widely separated times. And the law which the essayist has quoted of the articulation of the teeth governing the jaw movements, and the condyle and fossa forms, holds until the last articulating teeth are lost. With the loss of every tooth the masticating movements change, and after a while the fossa and condyle show a change of form in harmony with the change in movement. If several opposing teeth on one side remain long after all the other teeth are lost, the jaw movements will be found very unlike on the two sides. By the courtesy of Dr. Engstrom of Los Angeles, I expect to show you a slide which very clearly presents this condition. Dr. Mauk, of the University of California, reports differences of as high as 44° in inclination of lateral condyle paths between different patients. He reports also one case in which the downward condyle path on the two sides varied 47°.

Figure 2.



This shows the models mounted correctly on the articulator by means of the face bow.

Under these conditions of irregular loss of the teeth, the patient is sure to present very unlike masticating movements on the two sides of the jaw, when she becomes edentulous. But she will present definite movements which are habitual. Thanks to the law which the essayist has quoted, they will be the movements to which the condyle and fossa have been shaped by the action of the teeth last lost. They will be the movements to which the musculature is adapted, and they will be the movements to which the habitual nervous discharges are arranged.

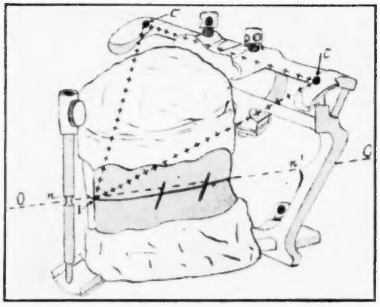
Right at this point, Dr. Gysi's contentions and the essayist's contentions are diametrically opposed. Dr. Gysi claims that the professional thing to do is to find out what are the movements habit-

ual to each patient, to reproduce them in an appliance and to arrange the teeth in harmony with them, to the end that these movements may be perpetuated and made immediately serviceable. Dr. Campbell's new plan is to make the dentures without relation to the individual jaw movements and bring the patient to them.

The merit of Dr. Gysi's claim is borne out by our history. Our emergence from discreditable failure in plate work has been measured by the degree of success with which we have arranged dentures to fit individual, habitual, jaw movements. A striking instance of the rightness of his claims is found in the fact that all the edentulous patients we have examined present definite jaw movements which can be utilized, with the exception of those who have been fitted to unscientifically made dentures. Such patients have almost invariably lost all definite control of the jaw movements, and most of their power in mastication, probably thru destruction of the former fossa formation and loss of control over the nervous discharges.

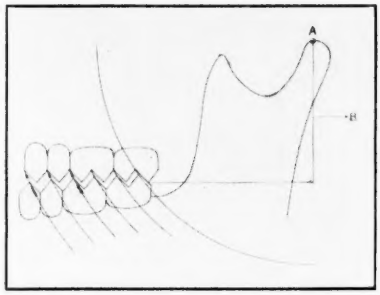
Dr. Campbell claims, if I understand him correctly, that all patients may be successfully fitted to one form of jaw movement, because, to quote his exact words, "any shape of condyle, glenoid fossa or articular eminence will begin to adapt itself to the new influences." Thanks in part to studies of which Dr. Williams is now engaged, it is possible to show clearly that this statement contains a large percentage of assumption, and probably of error. From the eruption of the permanent teeth to the age of the beginning of senile changes, this is probably true. But from evidence being gathered, it is at least believable that senile changes in the fossa and condyle may begin with the extensive wear of the teeth, and may go on independently of the guiding power of the teeth. These changes are progressively destructive of the form of the fossa and condyle found in earlier life, and, to my mind, the essayist's contention that you can shape any new fossa and condyle to harmonize with the arbitrary jaw movements of which he speaks, is rendered hopelessly unsound by three facts: first, that his arbitrary jaw movements, as I have heard them described by Dr. Hall,

Figure 3.



If an articulator having the rotation points correctly located is employed, the dentures may be mounted by Bonwill's triangle, as here shown, but not with the same freedom from error as when the facebow is used.

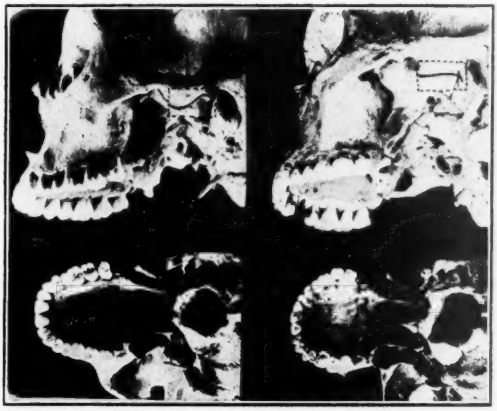
Figure 4.



If the bite is raised in an articulator having its rotation points in the condyles, the effect is to bring the teeth together in this manner.

require the restoration of the deep fossa of early life; second, by the fact that when senile changes have begun, you cannot reverse them and build again the forms of youth; and lastly, by the fact that even if this were possible, it is doubtful whether any artificial dentures are sufficiently immovable in position to permit such reconstruction.

Figure 5.



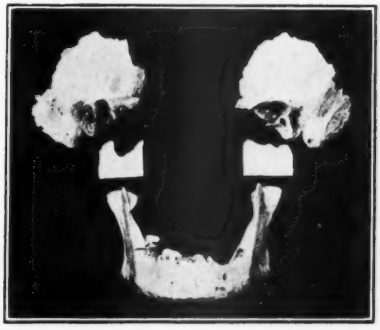
The figure on the left shows a fairly deep bite in the teeth and a fairly steep inclination of the articulating surface of the fossa. The figure on the right shows the teeth worn to a very flat bite and a correspondingly flat inclination of the articulating surface of the fossa.

Dr. Mauk's question may be very well asked here: "If methods of utilizing the patient's movements are available, so that comfort and efficiency in the use of artificial dentures may be quickly attained, why subject the patient to the annoyance, inconvenience and uncertainty of forming new and unfamiliar movements which, at best, will only approach the originals in efficiency?"

All the history of denture service, so far as I know it, is against the essayist. Artificial dentures have done one of two things: they have either perpetuated the movements habitual to the patient at the time of the loss of the last teeth, in which case they have been stable, comfortable and efficient; or they have destroyed those movements and have been comparatively unstable and inefficient, however comfortable they may have been.

I have not replied in detail to the title of the essay, because its principle seemed to me much more important. If

Figure 6.



The right temporal bone showing a fossa with a steeple inclined articulating surface, a cross section of which is shown immediately below the bone. The left temporal bone showing the ementia articularis worn away as per the cross section below it. The mandible, long edentulous on the left side but with teeth remaining on the left.

the essayist's principle is correct, all of his contentions follow. If Dr. Gysi is correct, measurements of the mandibular movements, the use of the face bow and the other steps which the essayist characterizes as "non-essentials" are either necessary, or at least advantageous. When you settle the question of principle, you settle all of the others.

Martin Dewey, of Chicago, Ill.

Mr. Chairman and Members of the National Dental Association:

In listening to the last speaker I could not help but believe he had missed the purposes of Dr. Campbell's subject or had very little idea of what the paper was about. There were a great many statements which he made which were very interesting to me and while he seemed to disagree with the essayist I could not help but realize that if he was allowed to talk long enough he would probably have proven all of Dr. Campbell's contentions, namely, "That the Measurement of the Condyle Path is not essential to the Construction of a Highly Efficient Denture." If you remember Dr. Campbell's paper is upon the construction of the efficient denture and not upon the construction of dentures which try to restore a condyle movement or path which has been produced by a faulty occlusion of the natural teeth. I was also greatly interested in the statement of the former speaker, namely, that the bone of the condyle wore away, which is an entirely new proposition to me because I had always supposed the bone was absorbed.

However, regardless of what changes take place in the condyle I will endeavor to show you some slides based upon anatomical investigation which seem to indicate that the movement of the condyle is controlled by the occlusion of the teeth or in other words, the shape of the condyle has nothing to do with the movement of the mandible, but the condyle assumes a certain shape because the mandible has taken a certain movement. I will also attempt to show you by a study comparative anatomy that the mandible depends upon the occlusion of the teeth and in natural or artificial teeth the efficiency of the dental aparatus depends upon the occlusion of those teeth. If you will carefully observe the number of lantern slides that I will show you beginning with the study of the anatomy of the temporo-mandibular articulation you will have a better conception of the location of this joint and the position of the condyle to the eminentia articularis than you would have if you listened to some of the information that is given out by dental manufacturers who are interested in the sale of articulators.

The temporo-mandibular articulation is composed of a number of ligaments which are as equally important in the construction of that joint as are the condyle and the glenoid fossa. In fact the shape of the condyle and the glenoid fossa depends upon the occlusion of the teeth and the movement of the mandible as produced by the occlusion of the teeth and it is allowed to move within a possible range of the length of the ligament.

The first ligament concerned in the temporo-mandibular articulation is the external lateral ligament which is attached to the external border of the glenoid fossa and to neck of the condyle. This ligament, besides limiting the movement of the mandible, also to a certain extent supports the synovial membrane which acts as a lubrication between the parts of the temporo-mandibular articulation and prevents the wear which we are told about by some speakers. However, placed between the head of the condyle and the eminentia articularis or the glenoid fossa is the interarticular cartilage

which further prevents friction between the two bony elements. Extending from the styloid process to the internal border of the ramus at a point very near the posterior border of the internal dental canal we have another ligament known as the stylo-mandibular ligament which also controls and limits the movements of the mandible. Another ligament extends from the sphenoid downwards and outwards and is attached to the mandible at about the same point that the stylo-mandibular ligament is attached. These two ligaments follow a general direction downward and forward and consequently these white inelastic fibers permit such movement of the mandible as can be accomplished without stretching those ligaments. When the mouth is opened to an extreme distance the "point of rotation" or the point of least movement of the mandible is the point of attachment of the stylo-mandibular and the spheno-mandibular ligaments. As a result of that the mandible may be said to be suspended between six ligaments which are inelastic and the movement of the mandible is furnished by the muscles attached to it. In extreme movements of the mandible when the teeth are not in occlusion, is controlled by six ligaments before mentioned. After the mandible has approached the maxilla sufficiently close to allow the cusps of the teeth to interdigitate then the movement of the mandible is controlled by the cusps of the teeth and the cusps of the teeth become the sole factor in deciding in which direction the mandible will move as it is further closed so all of the occlusal surfaces of the teeth come in contact.

I mention "all of the occlusal surfaces of the teeth being in contact" yet I realize that in certain of the lower animals such a condition as this never occurs because some of the teeth are never in occlusal contact in any stage of the process of mastication. However, in those animals there are certain teeth which have been developed for the purpose of guiding the mandible to a certain point so as to produce the most highly efficient masticating apparatus with that style of tooth. We also find in the study of the development of the temporo-mandibular articulation that in the embryos of any animal regardless of whether a carnivorous or herbivorous animal, the temporo-mandibular articulation is practically the same shape until the teeth come into occlusion.

We also find in the study of the evolution of the temporo-mandibular articulation that it is practically the same shape and until the teeth come into occlusion. We also find in the study of the evolution of the temporo-mandibular articulation that there has been a general style of articulation developed in the lower animal which was found in all classes in which the occlusion was very little and in which the masticating functions were not complicated.

However, as animals develop and the masticating apparatus become more complicated, we find the shape of the condyle and the glenoid fossa has changed as the shape of the tooth has changed. These changes have been so positive that in a study of the comparative dental anatomy if you will give any one who is versed in the science a tooth of any animal he will be able to reconstruct and draw for you the temporo-mandibular articulation of that animal without seeing it. With a certain style of tooth you will always have a certain type of temporo-mandibular articulation regardless of the nature of the animal.

We also find that as occlusion changes in certain animals the temporo-mandibular articulations will change in keeping with those occlusions. If you examine lower animals who are forced to masticate on their lower incisors you will find a certain shaped condyle in those animals such as exemplified in the rodent.

If you will also take the mandible of an individual who has lost all the molar teeth and has been forced to masticate on the incisors you will be surprised how similar the shape of condyle of the human who masticates on the incisors is to the condyle of the lower animal who also masticates on the lower incisor. It is equally true that animals who perform the masticating process on the molars as do the herbivorous animals, develop a certain shaped condyle; it is equally true in human beings who have lost all the incisors masticate on the molars that they will develop a condyle approaching the shape of the condyle developed in the lower animals. It simply proves that the shape of the condyle and the movement of the mandible is controlled by the occlusion of the teeth. Now, we are aware of the fact that certain prosthetic men have come to the conclusion that because the change in the occlusion of the teeth and the condyle has achieved a certain shape and the mandible a certain movement that we must interpret that movement to produce a highly efficient masticating apparatus with an artificial set of teeth. I am willing to admit that if you are going to restore the old broken down occlusion that will produce a certain movement of the mandible a measurement of the condyle will be essential. But if we are going to construct a highly efficient masticating apparatus then the movement of the condyle is not essential because we know that the best artificial teeth when placed in proper occlusion will compel the mandible to assume that particular movement regardless of the shape of the condyle.

We must also remember that the movement of the mandible is not influenced in any way whatever by the shape of the condyle but the condyle assumes a certain shape because the mandible has assumed a certain movement. Also, after the teeth and jaws are close enough together for the cusps to come in contact it is the cusps, and cusps only, which from that point guide the mandible to a certain position.

Therefore, in closing, I will only say that after you have studied these slides you cannot help but be convinced of the fact that the factor in moving or changing or controlling the movement of the mandible is the cusps of the teeth and not the shape of the condyle. Therefore, in support of Dr. Campbell's paper I can only say that comparative anatomy and the study of the anatomical construction of parts based upon the development of the temporo-mandibular articulation, leaves no reason to believe that a measurement of the condyle is essential to a highly efficient dental apparatus.

Harry J. Horner, of Pittsburgh, Pa.

You have heard the remarks of a gentleman from New York, and you have heard the remarks of a gentleman from Chicago. I come from Pittsburgh, which is half way between the two. New York got the worst of it from the Chicagos, a short time ago in the baseball game, and I do not want New York to get the worst of it today. I do not think I ever saw a greater line of proof than that given by this beautiful anatomical lecture we just have had from Dr. Dewey, of Dr. Clapp's statement that bone wears, nor as many pictures of worn bones. For teeth, I believe, are bones, or closely related to bones.

I would like to ask Dr. Dewey if he has ever tried to make a satisfactory denture for any of those patients whose pictures he has just thrown on the screen, and who must have come from some Zoological Garden.

In the first picture was show the worn bite of an individual which probably required forty years to produce the worn condition. Now if Dr. Dewey's statement is correct that you can adjust at the Temporo-Maxillary Articulation instead of on the occlusal surfaces of the

dentures, does it naturally follow that it will take a number of painful years for the unfortunate patient who has to wear dentures, to make the proper adjustment?

Geo. H. Wilson, of Cleveland, O.

The paper of Dr. Campbell is a very timely and important one. However, it presents modern ideas which are the extreme opposite of long accepted ideas. I believe with the essayist that the accepted ideas of the function of the temporomandibular joint and of the importance of the condyle path are radically wrong. Also that the attempted measurements of the gyrations of the condyle are unnecessary and misleading. The idea that the mandible is a lever of the third class is erroneous. It is a mill with the molars and bicuspids of the maxilla as the fixed attrition surface and the lower teeth as the movable surface of attrition guided into place largely by the cusps and inclined planes of the teeth. The ligaments and condyle are an outrigger apparatus to balance and stay the milling apparatus. A close study of the function of the ligaments and the parallelogram of forces as exhibited by the muscles of mastication will demonstrate this modern idea of the function of the temporo-mandibular joint.

The first discusser presented no argument when he appealed to the "gallery gods." To create a laugh is not an argument of the scientific fact.

The second discusser presented a scientific argument because he presented the anatomy of the parts. However, he wandered from the subject when he took up the comparative anatomy of masticaiton.

The function and importance of the temporo-mandibular joint and the gyrations of the condyle can only be determined by a careful study of the anatomy and physics of the parts involved; and this study will demonstrate that it is the cusps and inclined planes of the teeth that are the important factors in mastication rather than the gyrations of the condyle.

M. M. House, Indianapolis, Ind.: I did not expect to be called on for discussion as my knowledge of this work is from practice only. I have had the most beautiful and efficient results with the Hall method of articulation of any I have ever had experience with. I have been able to call in and correct a number of cases since taking up this work that had been failures in my hands. One case in particular, I had made six sets of teeth for without a success and he was at the office last Thursday telling of the comfort, service and satisfaction he has with the Hall dentures I made him more than a year ago, which is sufficiently satisfactory to me to cause me to feel the method and principle to be all right.

George W. Dittmar, of Chicago: I enjoyed Dr. Campbell's paper very much, and also exceedingly, the discussion. I have studied the Gysi system, which I have taught for a number of years, and I also have been following Dr. Hall very closely. I have been asked to say something of what I have seen as coming from Dr. Hall's technic. I will say that I have tried to make plates, and have seen dentures constructed by some of the best men in this country; but I have never seen anything that equalled the dentures constructed by Dr. Hall's technic. It is by far the best I have ever seen, and that brings up a point that has not been touched upon, viz., to obtain the best results with the Hall method new or modified tooth forms are necessary. Our present forms require too much alteration. To get the best results a great deal of grinding and polishing is necessary. The manufacturers need to give us some new forms of teeth—teeth with deep fossa and high cusps—just the opposite from what

we have been getting, then with the denture base made as Dr. Hall prescribes, most wonderfully efficient dentures can be constructed.

Dayton Campbell, Kansas City: Out of courtesy to Dr. Greene, who has a very interesting paper to follow—and I know from experience what it is to have one's time transgressed upon—I shall restrict my closing remarks to one statement, namely, that we have here today in this audience Mr. McClelland, Dr. Hope, and Dr. Smith, and I shall ask them please to stand that you may know them. These men are provided with gold, aluminum and vulcanite base dentures constructed after the Hall method. I shall not have a chance to give a clinic, but we are so vitally interested that these three men have accompanied me here and they are ready to give a clinic wherever you may meet them—on the staircase, in the lobby, or anywhere—and you may see in these practical cases how the Hall method has solved the problem of articulation.

I desire to express my keen appreciation of your attention and your courtesy.

THE DENTAL PROFESSION'S CONTRIBUTION IN THE PRESENT WAR EMERGENCY.

By Major William H. G. Logan, Chicago, Illinois, and Washington, D. C.

(Read before the National Dental Association at Its Twenty-First Annual Session, New York City, N. Y., October 23-26, 1917.)

Mr. President, Ladies and Gentlemen:

I WILL endeavor to speak from notes because there are a number of phases of the subject I wish to cover. You will have the privilege of asking any questions at any time you see fit, and I will endeavor to answer them if I do not make myself plain in my remarks to you.

In March of this year the Council of National Defense, thru its general medical board, called to Washington Dr. E. C. Kirk. Dr. Kirk was entrusted to secure the aid of the dental profession in assisting the army in the present war emergency. He appointed a committee of five men from the dental profession to assist him. The names of the five men he selected were Drs. G. V. I. Brown, of Milwaukee; Dr. Frederick B. Moorhead, Chicago; Dr. Weston A. Price, Cleveland; Dr. Herbert L. Wheeler, New York, and myself. The committee met in Washington in the early days of April or last days of March, organized and established certain rules and methods by which they would proceed to carry on the work. The following week or two the speaker was added to the general medical board and automatically was placed upon the dental committee. The work that has been carried on since by the committee was really organized by Dr. Kirk, but Dr. Kirk in the latter days of June, because of changing his business relations and professional relations tendered his resignation to the government, leaving the committee without a head. At that time the speaker was made chairman of the committee and the following additions were made to the dental committee to the general medical board of the Council of National Defense: L. L. Barber, J. W. Beach, Alfred C. Fones, Thomas P. Hinman, Otto U. King, John D. Millikin, Henry W. Morgan, Charles H. Oakman, and Harvey Burkhart. This completes the committee as it stands today.

We found early in Dr. Kirk's time the method of securing a commission to the Dental Reserve Corps was as follows: a man desiring to enter the corps should write to Washington, stating the corps he wished to join, and Washington would write a letter back from the Surgeon-General's office, enclosing an application blank. The application, when filled out, would go back to Washington, and the applicant would be requested for two letters to go to Washington. In the course of time he would be told to cross one or two or three states and secure a physical examination, and he would proceed to do so before there taking a professional examination. After having traveled over one or two or three states he might be examined and found he was physically unfit and would go back home, or he might find he was physically fit and proceed with the pro-

fessional examination, which would be returned to Washington for final action. This seemed to the committee to be a slow process to secure a sufficient number of dental officers that were immediately needed. Therefore, it was proposed that there should be examiners appointed in every state in the Union, known as preliminary dental examiners. The recommendation for the preliminary dental examiners was made by the chairman of the committee of enrollment of the dental committee to the general medical board on the Council of National Defense. Then the Surgeon-General taking these recommendations appointed these preliminary dental examiners, and who were they? They were made up of the secretaries of the examining boards of the various states of the Union, the deans of the dental colleges of the country, and enough other men, who were particularly suited for the work, so that in every state in the Union we had a number of examiners. After this was done we found out that there was not a man, excepting here and there in a fort or here and there in a barracks, who had been empowered by the government to hold a physical examination on an applicant of the Dental Reserve Corps, so then those men were added, so a board was made up in every state; examinations could start at home and be completed, and the only paper Washington ever received was one setting forth the completed application. The result of this has been from the early days of May and June until the 18th day of September these examinations were continued. But on the 18th day of September of this year, in less than five or six months time, enough dental officers were secured for the Army for the immediate and future needs. How many dental officers did we get in that brief time? We did not have two dozen, and only those at the time we started. When the examinations were closed on the 18th day of September we had of captains 19 in the regular corps, meaning the regular army, first lieutenants, 159, or a total number of dentists in the regular army of 178. This was on September 18. National guard first lieutenants, 297, Dental Reserve Corps first lieutenants recommended up to this date; of those the adjutant general commissioned up to and including October 20 there were 4,695. (Applause.) The number of those men who had accepted their commissions to that date was 3,902 or 3,703 men who had accepted commissions in that brief time. The total number of applications received for the Dental Reserve Corps and recommended was 6,251. The total number rejected for physical or professional reasons, and this is very important, was 1445, and the percentage of rejections for causes equals 23.1, which is the highest percentage in the medical profession, if you please, of rejections, so that we have taken our men as carefully as we could.

Now, why did we close the examinations? Because we had enough to meet the growing needs permitted by law for an army of 4,378,000 men, ready to be called tomorrow if the country needs them. We have 700 more who have been tendered their commissions but have not accepted them, but if we should urge them we could probably get 500 or 600 out of that group. We have in the Surgeon-General's office in the War Department 130 or 140 more to be recommended to the Adjutant-General whenever he will receive them. What do we mean by the expression, "whenever he will receive them?" About ten days ago an order was issued to get no more, or to give out no more commissions. There would be no more recommendations for commissions received in any department of the army until we can adjust matters in the office of the Adjutant-General. We do not know whether they will come to the conclusion that we have enough dental officers or not. We do not know whether they will ever let us have these

men commissioned or not, but if they do we will have enough to care for an army of 5,000,000 men, and if they do not we will have enough to take care of an army of 4,378,000 men at the rate of one dentist to a thousand. The law says we shall have one to a thousand of the regular army of dental officers, but it further says in reference to the Reserve Corps of all sections of the army that you shall have a certain percentage except in the lower grades. In this grade you can have more. We do not intend to have the law changed. We can have more than one to a thousand in the lower grades of lieutenants.

The question comes up what should be done with the dentist who has been commissioned of military age, but has not been assigned to duty? If he is a boy, walking around in your city, we are not so much concerned about him as we are concerned about his fellow practioner, who has already been drafted and now has been in the camp as a private. Every man who holds a commission and is of military age and has not been assigned to active duty as a dental officer is subject to the rules of the local board, and unless something can be done to satisfy the local board, he must proceed to the camp as a private and there remain a private until he can be placed on active duty as a dental officer. You say that is wrong. So do I, but it doesn't make any difference. On that question I have made many trips to the Adjutant-General's office and to the Provost-Marshal's office. But why do that? Under the law the commissioned Dental Reserve Corps officer of military age stays at home until needed as an officer. Here is the answer as they give it: the dentist is not made of any different material, nor is he any more highly educated than the graduate of some great university, some engineer, some electrician, some great lawyer, tho a young man. He must proceed to the camp when his number comes out in the draft the same as other human beings, and the Medical Reserve Corps man who is not assigned to duty is down in the camp just the same as the dental man. This condition was no different than what I have told you until the second or third day of October. They had forms which were not effective to relieve these men, but on the 2nd day of October we did get certain forms from the Provost-Marshal's office that have been successful in permitting a Dental Reserve Corps officer of military age, who held a commission, not to be assigned to duty until we wish to call him to active duty. Remember this so you will not make a mistake. If you have a friend of military age who has a commission that he has accepted, let him write to the Surgeon General's office and request for two forms. They usually relieve him from military call until he is assigned to active duty as a dental officer. One of the forms will go to his local board, and the other to the Adjutant-General's office of the state, and for what purpose? The one that goes to the local board on the day that the man would have proceeded to camp will be sent to the camp instead of to the man on their record as one man credit from that local board. The other goes to the adjutant-general, and in the adjutant-general's office that state is given credit for one man. Do not get confused on that. If the man does not get these two forms before the local board turns him over or back home, if he steps upon the train, he steps out of control of the local board and steps into the management and control of the regular army, or the national army. On the train he belongs to the federal government. Before he takes the train he is under the management of the provost-marshal's office and the local board. The forms of exemption are given by the provost-marshal, and they hold good so long as the provost-marshal has charge of the man, but when the boy gets into the camp we can do nothing for him in the

way of letting him remain at home. What of the fact when he gets into camp? What should he do? He should not write to the Surgeon-General's office to fix it up. We are without jurisdiction. He should take the matter up with the commanding officer of the camp, request a transfer to the medical departmen and be assigned to duty as a dental assistant until the time comes that he can be placed on active duty as a dental officer. That is what you should do.

What of the dentist who has made application for a commission but the commission has not arrived? We can't give him any forms. The man who has made application for a commission, but has not the commission must proceed to the camp, and it is in the camp he remains until the commission comes, and he can before the commission comes or after it comes make a request to go into the medical department and be assigned as dental assistant.

What of the drafted man who has never made application? He must take the examination at home. Examinations are closed to the Dental Reserve Corps only under certain circumstances which I will speak of later. If he has made application for a commission he must proceed to the camp and take the examination in the camp for the present, and why say present? I rather think the Adjutant-General will send word to the medical department that we do not wish any more Dental Reserve Corps officers commissioned. We have enough. Don't take any more of military age, at least. So the boy who does not make application, who has waited and has not yet tried until after the 18th day of September, and is drafted into camp, he may or may not have another chance to become a dental officer. You had better know that fact, but he always has the chance to become a dental assistant so long as there is a vacancy. Before I leave that phase of the subject, I have one hope about it. I hope that some of the dentists will take kindly to that! I hope that some of the dentists will say, "I would like to have a chance to be a private, work my way up thru the ranks, and show to the world that the dental profession can produce the same men as the medical profession and receive actual promotion for the things he does the same as the medical profession." And why can't we? When you men have not felt entirely satisfied and perhaps things have been wrong, I would like you to have had a chance at it. I don't feel that way now.

As to the question of student exemption, when I went to my room I found a number of questions on that subject. You know something about that already. Students are permitted to enlist in the Enlisted Reserve Corps of the Medical Department. If a boy is drafted, who is a dental student, and is taken to the camp, he is permitted to make application to the medical department to be placed in the Enlisted Reserve Corps of the Medical Department and returned to complete his course of instruction, and he must complete them. At the end of each semester the dean of the school must report to the Surgeon-General that the man has successfully passed the examination and has been placed into the second semester. If he fails, he drops out of course and proceeds to the camp. If upon graduation day his name is not written there, it will be written in the camp, and he will proceed in person. It is not an exemption. It is a postponement until he gets his education, which is fair and just, but he will give service. He will not be free when he gets his diploma. The man of military age—I don't care who he is—must do his part until this war is over. (Applause.)

When a student graduates we are going to take him. We are going to put him in some place, but if the medical department decides he will be of more use in a town where the dentists have all been taken out, he will be permitted to proceed there and practice until the war

is over. He will be subject to call by the Surgeon-General's office.

The question comes up now, what have we done with these dental officers, the assignment of dental officers? The general assignment occurred on September 3rd. It is a fair question to ask. Another fair question for you men to ask is, how is this brought about; how did we reach the conclusion which took so many from this state and so many from that state? On the 3rd day of September we had, relatively speaking as it occurs to me, about 2800 men who had accepted their commissions in the Dental Reserve Corps. We saw fit at that time to take on a little less than 50 per cent. of these men and assign them to duty. In other words, in each state we first counted how many we had, then we proceeded to take out the proper percentage from each state, taking into consideration the number we had previously taken out of that state the week previous or that we might have sent abroad or some other place; in other words, 45 per cent. of all men we had commissioned then being placed on duty, if we took in the proper rotation with which the commission was given. We did not. I might as well tell you so. We were not concerned about that, and did not follow that rule and will not follow it in the future. Why? Among the first third we found a good many men that were of a given age. In the next third we found a good many of another age, so what did we do? We tried to take so many experienced men, so many of the younger men, and so many very excellent men that we have. You can dilute a thing to a certain point and get along very well. To dilute below that it is not wise. We did not dilute it below that point. If tomorrow some young man was commissioned whom we knew to be more valuable than others who had received a commission, we will take that man and put him in the army. We are not trying to serve the dental profession in that respect, but we are trying to serve the man who is serving his country in the trenches. (Applause.) How many have we on duty? I will not tell you, but I will give you some idea. It is more than 1500. But these are commissioned officers, and I am not speaking of commissioned officers and their assistants. We have more than that many on duty. We have been told that we have more commissioned officers in the Dental Reserve Corps at this time than any nation has or ever had in the history of the world. (Applause.)

Now, if I may have some pictures thrown upon the screen, I can show you something about what we are trying to do.

There was a kind of general idea that we had a great many youngsters and that the early ones were all recent graduates. Let me tell you of the fact of the first 1,000 commissioned, there were only about 75 men on the first thousand who graduated in the year 1917. They are not youths; they are remarkable boys who are holding commissions, members of the 1917 class.

There is one other phase of this work that we are carrying on and to which I desire to call your attention. There is a department known as the surgical head unit which is made up of a brain surgeon, an eye surgeon, ear, nose and throat surgeon, and a plastic or oral surgeon. What is a plastic surgeon in the definition of the government? A plastic surgeon is a man with an M. D. degree only who does plastic work well and bone grafting well, and is skilled in the treatment of these cases of injury about the face and jaws. We must have in each head unit a plastic surgeon or oral surgeon. What is the definition of an oral surgeon in the eyes of the government? An oral surgeon must have both a license in medicine and in dentistry. I say these things because we have men who have honorary degrees in these. He must have a license to practice each. Besides the other plastic or oral surgeon, we must have in all cases a dental oral

surgeon. What is a dental oral surgeon? He is a man who is a dentist skilled in minor oral surgery. With the oral or dental surgeon we have a dentist in this unit who is classified as a dentist, and a dental oral surgical assistant. This is the way we are caring for the special wounds of the face, jaws and head.

What is the latitude given to the dental oral surgeon? He has all the operations above the clavicle and below the base of the brain, except the eye, the ear, the nose and throat. The dental oral surgeon, will assist the oral surgeon or the plastic surgeon, as the case may be, in the operations, and he will care for the cases afterwards, so that when the history is written of the dentistry of this country in the future in relation to the army, I am sure it will be something like the brilliant history of the dentists of the north, also in Canada, and something like the brilliant history of the Dental profession in France and in England. (Applause.)

Do not entertain the idea that you must enter the army in order to acquire this acknowledge that is so essential. Unless you possess it now pretty well, we don't want you to go to the army and learn how. We would like to know the men who do know something about this work so that they may be properly assigned, in order that the history of dentistry in this country, in so far as it pertains to our phase of the work, will be well cared for. To the dentists who are in the camp, I would say, go on and do your work. There is a great responsibility resting on you. You must do your work; I must do mine. We must not be influenced by what some men may think, but we must be influenced in our relations to the army and to the result, as well as for the good of the men.

Now, gentlemen, you can ruin the future of dentistry in another way. A dental law was passed the other day. It may and probably does include the Dental Reserve Corps. If it does not, I am sure regulation will come to include the Dental Reserve Corps up to and including major. When it comes, and it will come, don't write a letter for every man who asks you to have him promoted, but write a letter in favor of every man who is entitled to promotion. Don't neglect to write such a letter and tell us the truth, but don't state anything else because the future of dentistry depends upon getting the right men promoted. If the wrong men are promoted it will be a great injury to everybody. Now, gentlemen, either keep your letters at home or recommend the men for promotion who deserve it. I thank you. (Applause.)

METHODS USED IN HANDLING THE MID-WINTER CLINIC OF THE ATLANTA DENTAL SOCIETY.

By Thos. P. Hinman, D. D. S., Atlanta, Ga.

EVER since Dr. Weston A. Price first suggested the progressive clinic, various applications of this clinic method have been used in several parts of our country where Dental Meetings were being held.

In some instances the Clinician was progressed and in others the audience progressed, each method having its adherents.

Several years ago the plan of having Post Graduate Schools at State Societies was inaugurated in Oklahoma, the plan being suggested and carried out by Dr. B. A. Shobe at a meeting of the Oklahoma State Dental Society. From the first it proved a great success, but as all new things, it lacked organization and system which would allow the best display of the talent employed.

It was my very good fortune to be one of the instructors in the second Post Graduate School held in Oklahoma, and it was there, while in attendance, that the thought of combining the progressive clinic with the Post Graduate course came to my mind.

On returning home the subject was broached at the next meeting of our city society and instantly met with a most cordial response.

A committee was appointed to take charge and was known as the Mid-winter clinic Committee. This committee was given plenary powers to organize and conduct the clinics without referring anything to the Society for approval.

At the first meeting of this committee the question of the best method to be used was discussed and the following plan was evolved, which, with minor additions, has been used for five consecutive years.

First, the following sub-committees, were appointed by the Chairman:

Committee on Arrangements.

Committee on Invitation and Membership.

Committee on Reception and Entertainment.

The Reception and Entertainment Committee have in charge the different Clinicians as they arrive. They are required to meet the Clinicians at the train and escort them to the hotel where rooms have been reserved for their comfort. They are required to see that the Clinicians are never alone, unless they prefer, and when they leave, this Committee makes all of their railroad reservations and escorts them to the train.

The Committee on Arrangements has entire charge of the hall where the meeting is held, as well as the different clinic rooms are required to have everything in perfect order, so that there will be no possible delay when the meeting is ready to open.

The Invitation and Membership Committee sent out their notices and the first 120 who responded were issued membership cards, entitling them to attend the Clinic. After this number has been secured, no one else was allowed to attend, unless one of those who had accepted failed to send his check promptly for the clinic fee. This fee is

variable; if we have only three Clinicians, a fee of $6.00 is charged; if five, then a fee of $10.00.

The Clinic was to have a limited membership, i. e., only forty men were to be allowed for each Clinician, thus, if three Clinicians were to be used at one meeting, the membership was automatically 120.

The trouble with most meetings and clinics in the past had been that no one man could see and hear everything that was taught, therefore, the following method was evolved to correct this difficulty: Knock down amphitheatres were constructed, three tiers high and so made that each tier would hold ten chairs and then 1 row of chairs was placed on the floor in front, this made the seating capacity forty, which was exactly the number desired. After the chairs were in position the floor under each chair was numbered serially; these numbers correspond with the coupon on the ticket.

On the opening day each member presented his membership card and received from the secretary a coupon ticket which called for a specific seat in the amphitheater. This ticket had three coupons on it and the first seat number called for by the ticket entitled the holder to a seat on the first row if the number was from 1 to 10, but the next coupon on such a ticket called for a seat in another clinic on the back row and therefore was numbered from 31 to 40. The next coupon called for a seat in another clinic in the middle row of seats, thus every one in attendance had an equal distribution as to seats.

These coupon tickets were made in different colors so as to distinguish the clinics in the beginning as follows: Red cards go to Clinic No. 1; yellow to Clinic No. 2, etc.

The coupon for each clinic besides bearing the number of the clinic, bears the name of the Clinicians whose subject is given in the official program.

To make the distribution of men equal at all times, the secretary who makes the distribution has these coupon tickets in equal piles before him and takes only one ticket from a pile at one time.

Each Clinic has a captain and two ushers; the captain has entire charge of the Clinician and assists him in every way possible. He is required to keep order in the audience and not to allow any questions asked the Clinician that are not relevant. He also prevents the Clinic "Smarty" who wants to tell everyone how he does it, from talking. Discussions with the Clinicians are positively prohibited. Questions are allowed after one hour. Conversation between members of the audience is not allowed and everyone is required either to remain seated during the clinic or to leave the room. Smoking during the clinic is positively prohibited. The ushers see that the audience is properly seated and are required to do anything that is requested by the captain, such as run errands, etc.

Each Clinician is furnished with a small stereopticon and an operator (one of the ushers usually does this) so that he may illustrate objects that may be too small for all of the audience to see.

Each Clinician is allowed one hour and 20 minutes for his Clinic, then ten minutes rest when he is taken away from his clinic and put in another room. This prevents the "nuisance man" from trying to get something more out of him after he is thru, and allows the Clinician to rest.

In minor surgical work the operating chair is placed with its back to the audience but faces a large mirror, size three feet by five, which is attached to a stand and frame like a black board, the room being darkened and the patient's eyes covered; a spot light is thrown on the patient's mouth and field of operation; all this is reflected in the large mirror; the audience looking in the mirror can see perfectly the operation as well as the movements of the hand of the operator,

who, in this position, faces the audience. With very little effort the operator can keep his head out of the sight line of the audience, the mirror being placed at a proper angle so as to give the best possible view of the operation.

When root amputations are done or extractions of impacted 3rd molars are made, lantern slides from X-Ray pictures of each case have been previously prepared and are shown on the screen during the entire operation, the operator giving a short talk on each case before beginning.

Each clinic is in a large separate room and the usher attends the door and no one is allowed to come in who does not have a coupon ticket. When the clinic begins the door is shut and the late comer is not allowed to come in and interrupt.

All clinics are carried on at the same time and when the ten minutes recess is over, the Clinic No. 1 will progress to No. 2, etc.

Clinics begin at 9:00 A. M., to 12:00 noon; begin at 2:00 P. M. and close at 5:00 P. M.

Last year we had five Clinicians and each Clinician read or illustrated a paper before the whole membership, besides giving five clinics.

The following is one of our programs:

THURSDAY, MARCH THE 15TH, 1917.

10:15 A. M.

Opening by the Master.....Thos. P. Hinman

Welcome to Atlanta.....Bishop Candler

Invocation.....Dr. J. E. Dickey

11:00 A. M.

Surgical Treatment of Dental Diseases—Dr. Chalmers J. Lyons, Ann Arbor, Mich.

THURSDAY AFTERNOON, 2:00 P. M.

"2" Clinics.

3:30 P. M.

All Clinics Progress.

THURSDAY EVENING, 8:00 P. M.

Root Canal Problem—Dr. J. R. Callahan, Cincinnati, O.

FRIDAY, MARCH THE 16TH, 1917.

9:00 A. M.

Fundamental Principles Involved in the Treatment of a Mouth Relating to the Application of Removable Bridgework—Dr. Carl Knoche.

15 Minutes Intermission.

Clasps for Partial Dentures Showing Many New Forms—Dr. Norman S. Essig, Philadelphia, Pa.

FRIDAY AFTERNOON, 2:00 P. M.

"2" Clinics.

3:00 P. M.

All Clinics Progress.

6:00 O'clock Sharp.

Complimentary Banquet to Dr. Frank Holland, in Ansley Hall.

8:00 P. M.

Can the Occlusion of Dentures be Regarded as a Reliable Basis of Diagnosis and Treatment in Malocclusion of the Teeth—Dr. Calvin S. Case, Chicago, Ill.

SATURDAY, MARCH THE 17TH, 1917.

9:00 O'clock.

"1" Clinic.

On account of the fact that Clinics are held progressively, it is absolutely imperative that every member occupy his seat promptly so as to avoid confusion.

After Clinics start, no one will be allowed to take his seat in amphitheaters. Clinic masters are instructed to strictly enforce this rule.

Membership cards admit to banquet.

By this method we read five papers and gave twenty-five clinics beginning Thursday morning at 10:30 A. M., and closing promptly at 12:00 noon Saturday.

The answer is team work. Every member of the Clinic Committee knows

how to take the message to Garcia. His job depends on the thoroness with which he does his work and every man is on the job every minute from the time we start holding committee meetings until the last clinic is finished.

The amphitheaters are taken down piece by piece, each piece being numbered. These are all stored away until another year rolls around and then are reassembled according to number. The same man who is the hotel carpenter, does this work each year.

DISCUSSIONS.

Dr. Fowler, New Jersey: The idea of having someone in particular definitely in charge of a dental convention has worked out well and the dental profession is coming to the point where efficiency demands this method. The old way of having divided authority does not work; single authority in charge, as Dr. Hinman has spoken of or as the New Jersey State Dental Society put into operation this year, is far better. Where we have a divided authority in the management the expense is multiplied and efficiency is decreased. The manager of the New Jersey State Convention is vested with final authority covering all details of staging and placing clinics and exhibits. I wish to express my approval of having State Dental Conventions thus controlled.

I want to say something about the lack of interest in State Dental Societies. Our interest in things depends upon what we are going to get out of them; our interest in a golf club or social club or any other organization depends upon what we get out of it, and rarely do we get something for nothing. This bugaboo of keeping the dues down is a great mistake; dues are absolutely necessary to secure money with which to operate and thus make for better results. A man who puts up his money for a definite object is interested in getting that result and the man who hopes to get results by lowering the dues is whipped before he starts. Dr. Ebersole told me that in one of the Western Societies, I think it was in Cleveland, the dues were three or five dollars a few years ago and that when they raised them to twenty-five dollars a year or thereabout, instead of dwindling in membership the society was immediately increased. Twenty dollars dues does not detract from interest in the society but act contrarywise. I want to express my disapproval in the reduction of dues because it has been shown that the way to pull up a society is to raise the dues and give results accordingly. If a man pays well for what he is getting he appreciates what he receives in return.

Dr. Wright, Ohio: I would like to know if that arrangement could be carried out in our society where we have from 12 to fifteen hundred members.

Dr. Hinman: No it could not be done for the whole society but would have to be done in the sections and the clinics would have to be repeated numerous times and that way it could be done equally as well for a large number.

Question: What is the largest number you have at your clinics?

Dr. Hinman: Last winter we gave five clinics and that provides for 200 men; we can give six clinics and that would accommodate 240. The only objectionable feature is that it is a great strain on the clinicians and this is the only thing that limits the plan. The work simply exhausts the clinicians. We work the life out of them, there is no question but that it is hard work.

Dr. Lawrence: Would it be possible at another meeting of the society to work this in?

Dr. Hinman: There is no limit to this plan if it is carried out in the sections. We have a knock down amphitheatre which costs $35 or $40 and we have used it five years. I hope if there is anyone here who has attended this clinic he will discuss it.

Dr. Lawrence: What have been your fees?

Dr. Hinman: All of the clinicians are paid. Usually when we ask these men to come and give the clinics they refuse to ask for a fee but we give the fee. These clinics are practically self-supporting. The 200 men at $10 apiece brings in $2000 and the cost of the whole thing was over $1900. The men feel that they get something for their money. If one man is interested in a certain thing and has no ticket to it he can swap his ticket with another man who would rather see what the first man does not care about. The men can swap tickets and see the same clinic twice if they want to or they can exchange coupons and a man who has a back seat can get near the front in that way if he is specially interested in a particular clinic. By allowing this exchange of coupons the men can manage to see just what they want to see most.

Question: Have you plans for making the amphitheatre?

Dr. Hinman: I have plans of the amphitheatre, the mirror and the coupon cards and everything. They have been drawn to scale and all the dimensions are given.

Dr. Lawrence: About procuring talent, do you make contracts?

Dr. Hinman: My experience with the profession is that the type of men that we want never say anything about what we are going to pay and we never make a contract but we pay each one $200 and his hotel expenses and he pays his own traveling expenses. Then we give them the best kind of treatment while they are with us. When a man comes he is met at the station. When he reaches his room at the hotel there are flowers there and they are renewed every day. When he wakes in the morning he receives a copy of his home newspaper and of the Atlanta paper. During the clinic he is every little while given a pitcher of lemonade or a fruit punch. We do these little things all the time and it makes it very pleasant for the men and they always want to come back.

A DISCUSSION OF SOME PHASES OF THE PRINCIPLES AND PRACTICE OF FIXED BRIDGE WORK.

By A. J. Bush, D. D. S., Columbus, Ohio.

(Read before the National Dental Association at Its Twenty-First Annual Session, New York City, N. Y., October 23-26, 1917.)

IN CHOOSING to discuss some phases of the principles and practice of fixed bridge work at this time, I do so with the feeling that the true science and art of the practice of fixed bridge work and the real beauty and utility of its application and usefulness is rapidly being overshadowed by the accumulation of failures and attending bitter experiences that follow in the wake of the most flagrant disregard of the fact that, so long as this type of work is applied to living tissues, the work must be applied in accordance with the correct principles of practice and made compatible to the health of the living tissues to which it is attached. True, there is nothing desirable about fixed bridge work or any other kind of bridge work for that matter, at least we might question anybody's judgment who would intentionally sacrifice perfectly good teeth just for the privilege of wearing bridge work. Every layman knows that the teeth that God gave him will perform a better service than any tooth that dentistry can ever devise, and by the same token everybody knows that artificial teeth have potential possibilities of rendering better service than no teeth at all.

It follows, therefore, since artificial teeth are less desirable than the natural teeth and decidedly more desirable than no teeth at all, that the employment of bridge work is the lesser of two evils, and furthermore, that the method of attachment employed is invariably the result of a choice between the lesser of two or more evils.

Any dentist, however, who elects to make removable bridgework in preference to fixed bridge work, in those cases where the latter is equally applicable, just because he recognized that his results in fixed work have been failures, is jumping out of the frying pan into the fire and I wish to remind him that by virtue of no method will he sidestep the penalties of his own shortcomings or escape the consequences of his own inefficiency.

The practice of both styles of bridge work are fundamentally based upon the same considerations, and genuine service in either will never be rendered until a more complete comprehension and mastery of the sciences upon which the principles are based, are realized, and not until a more intelligent understanding of the requirements which most intimately concern its scientific application is more generally recognized as being fundamental.

Too much repletion, therefore, cannot be used in teaching the importance of the requirements, neither can too much emphasis be laid upon correct principles of practice, for it is only thru lack of observance of both that failures are so abundantly recorded, and thru their faithful observance, that the fullest measure of professional service can be rendered.

In the entire field of dentistry no

phase of its practice has been singled out for criticism so much, perhaps, as has bridge work, and fixed bridge work especially; indeed, this is so true that the very mention of septic dentistry summons to our mind visions of bridges by the score that are so totally out of harmony with the governing principles and requirements that no power on earth could repair the damages which have been wrought by their tolerence.

Let us hope that bridge work is generally made with the single thought of

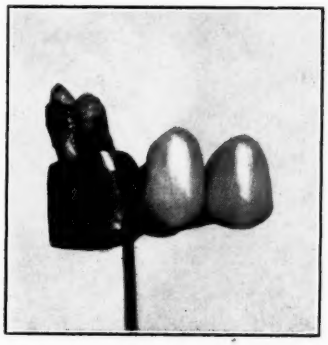


Figure 1.

rendering a service to our patients thru increasing the efficiency of dental apparatus to better perform its functions of mastication; and furthermore, let it be remembered that, while this particular service may be partially rendered thru procedures that more intimately concern the mechanical and anatomical requirements, the physiological and hygienic requirements must also be observed, lest this increasing of the functional efficiency of the dental apparatus be more than offset by establishing conditions which may prove far more serious to the health of our patients than would be caused by the impairment of the dental apparatus thru the physical loss of the few teeth we are striving to replace.

Fixed bridge work which has proved to be the most successful and has rendered the fullest measure of service thru years of vigorous usage, is work, which first of all has been made in accordance with the principles that it should be attached to, or supported by, one or more abutments, when of straight alignment and should receive additional attachment and support from one or more intervening abutments or piers when of curved alignment.

This law we believe to be based upon sound physiologic and mechanical principles and is one which may be intelligently and definitely understood and specifically prohibits the employment of fixed bridge work in all cases where there is an insufficiency of anchorage teeth for proper support.

Fixed bridge work which has been constructed and applied outside of this principle is in some degree a failure from its inception and if it is possible to compare failures, it is noticeable that the degree of failure seems to be in proportion to the extent of deviation from this principle.

Figure 1 is illustrative of this point. Here we see a bridge that, even after granting that it might have been made in exquisite harmony with the hygienic, anatomical, mechanical, and esthetic requirements, still we can readily see it was predestined to fail because it did not comply with the principle of having at least one abutment at each end.

Figure 2 illustrates the same lack of judgment, except that it seems to be more ingenious in the character of its departure from principle. Here we have two common examples of somebody's art craft, which are cataloged under the name of fixed bridge work, a rank travesty on correct principles of practice, yet they are representative of what is being used as an indictment against fixed bridge work in general.

When fixed bridge work is made without being supported by, or attached to, one or more abutments at each end when of straight alignment and by one or more intervening abutments or piers

when of curved alignment, they are doomed to failure, because the direction of masticatory stress is misdirected thru

Figure 2.

leverage and the supporting tissues surrounding the roots fail to render support just in proportion as the stress is perverted and the supporting tissues are

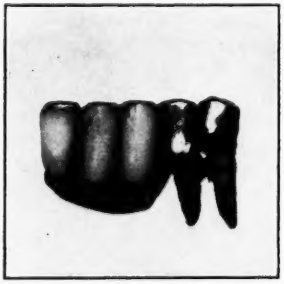


Figure 3.

obliged to offer resistance in a direction they never were designed to furnish.

Figure 3 shows the same type of failure. In this specimen we find a feeble attempt to overcome the lack for a support at each end by the use of a saddle.

Here again we have a fixed bridge, so called, manifestly out of principle, in which we find two abutment crowns all at one end carrying dummy substitutes enough to supply the equivalent of two molars performing all of the functions of the first and second class lever, an efficient device for extracting two teeth

Figure 4.

at once, a service which it promptly performed. In this case the first, second and third molars are missing, or in other words, no posterior abutment is available; therefore, if this law as enunciated, is based upon sound principles and if physiologic laws governing the direction of stress have been correctly interpreted, then this style of fixed bridge work and all other varieties of the same kind are contraindicated and furthermore, as in this case, even if a saddle is used, it would seem more correct and more in accord with good principles of practice to make restorations for this class of a removable character

because of hygienic considerations, if for no other reasons.

Figure 4 shows another fixed bridge which failed because of two contributing factors; first, because it was supported at one end only and hence contraindicated, and second, because the abutment crown does not comply with the mechanical requirements of adaption or fit.

Figure 5 shows still another fixed bridge with a very interesting history. This bridge as originally made extended from the cuspid to the second molar and supplied the two intervening bicuspids

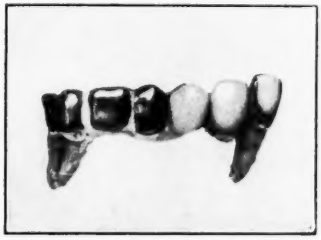


Figure 5.

and first molar forming a simple five tooth bridge with a shell crown for the second molar attachment and a dowel crown with plate and no band for cuspid attachment.

After a few years service the cuspid root split. The bridge was removed, the cuspid root extracted and the bridge replaced, using the lateral for the anterior abutment in lieu of the lost cuspid. After a few years more, the bridge, together with both abutment teeth, was removed enmasse without the use of instruments.

Here again we have a failure upon a failure, or a series of failures, resulting from non-observance of the requirements and correct principles of practice.

The failure of this case may be explained as follows, i. e., in the first place the mechanical requirement demanded a full band for the cuspid dowel crown and second, the same requirement demanded a dowel equal to the length of the cuspid crown. Had these details been observed in a manner prescribed by this requirement, the cuspid root would not have split.

The second failure was caused by extending the bridge anteriorly in order to utilize the later tooth for the anterior abutment which resulted in a fixed bridge of curved alignment without one or more intervening abutments or piers.

In other words, the case as first made was in principle but failed because it

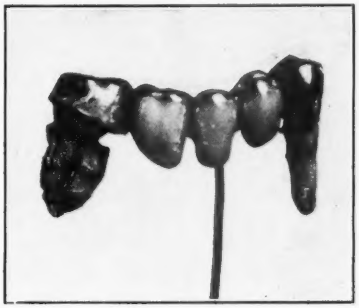


Figure 6.

was not made according to the mechanical requirements which should have governed its construction, and the second failure was caused by making a fixed bridge for a case for which principle would contraindicate its employment.

Figure 6 shows a fixed bridge which was in the mouth less than three years and during that time rendered little or no service to speak of. The attachment of the molar root was completely destroyed and a pull with the fingers was sufficient to break the few fibers that remained of the peridental membrane of the bicuspid root. This bridge was contraindicated and never should have been made because of the fact that the first requirement should have prohibited its employment.

I refer to the physiological requirement. This requirement demands that

the abutment teeth or root and their supporting tissues shall be in a state of health as a prerequisite to the employment of bridge work, and the history of this case points very clearly to the fact that the abutment teeth in question were not in a state of health when the bridge was attached, and furthermore, that no effort was made to comply with this requirement after its placement.

Figure 7 shows the most popular form of attachment for fixed bridge work; the gold crown, the most abused, the most criticized object that dentistry has ever produced, popular because of its remarkable availability, abused because of its indiscriminate employment, and criticized because the most distorted, misshapen, malformed, anatomical parodies ever conceived of are being offered as substitutes for the divine tooth formations.

"The Gold Crown must go," we hear from everywhere; it is blamed for failures in all of the operative procedures performed upon the human teeth before it is adapted and is charged up for all of the pathological disturbances that affect the teeth after its adaption.

Now, why blame the gold crown? Whoever saw a gold crown? Whoever saw a gold crown which made itself? If a gold crown is made to more strikingly resemble a rain barrel than the natural tooth formation, why not say that the artizan who made it must go?

Very few operative procedures in crown work offer greater possibilities than the shell crown, and I know of no method of crowning that in any degree lends itself so favorably in complying with the anatomical features of approximate contact, articulation and occlusion, or the mechanical features of adaption, durability, attachment, and permanency, or lend themselves more favorably for abutment pieces for assemblage in bridge constructions than do gold crowns, and I know of no crown that excels it in any other particular except the esthetic.

The lesson to be learned from these failures presented which are fairly typical of the most common failures that we encounter, is that the failures are not because of the fact that the bridges were fixed but because of the fact that the bridges were not applied according to principle and not made with the proper respect for the requirements that concerned the safeguarding of the living tissues to which they were attached.

Figure 7.

The skilful and legitimate practice of fixed bridge work should not suffer because some choose to practice it otherwise.

The application of fixed bridge work, in a manner that clinical experience has repeatedly demonstrated to be successful, should not be ostracized just because some one does not or cannot perform a similar service successfully, and it seems that the time has come for us to recognize this fact and that some organized effort must be made to purge our profession of practices which are so manifestly obnoxious.

THE STATUS OF APICOECTOMY.

By S. L. Silverman, D. D. S., Professor of Anesthesia and Associate Professor in Oral Surgery Atlanta-Southern Dental College. Lecturer in Oral Surgery (Advanced Course) Columbia University. Oral Surgeon Local Hospitals.

SO voluminous has been the literature on the subject of apicoectomy that it were indeed redundant to add to it unless, of course, certain changes were suggested or criticisms recorded. First of all, there are fallacious opinions extant concerning this subject that it were better for me to recognize at the outset; for it is the existence of these opinions that promoted me to write on this subject when invited by The Journal Editors to prepare a paper.

The points of contention from which the above referred to opinions arise, may be stated briefly as follows:

(1) Whether to employ the bur or chisel.

(2) Sealing of the amputated end with amalgam or other material carried thru orifice of wound.

(3) The amputation of tri-rooted teeth.

(4) The method of closing the wound.

(5) The life of an amputated root.

Discussing these questions in the order here outlined, permit me to say that the burring away of the bone and apex of root certainly preceded the chisel method. It remains then to ascertain whether the advocates of the latter method have concrete reasons for abandoning the former. Succinctly, my reasons for advocating the chisel are as follows: a *sharp* chisel will accomplish all that the bur does (1) with consumption of less time by virtue of the fact that larger pieces are removed at a single stroke or two, (2) will not clog or heat, therefore, dispensing with the need of a cooling irrigant to counteract frictional heat, (3) is not causative of an accumulation of debris emenating from the invaded bone and root, which debris mingle in color destroying the already ill-defined contrasts existing in the appearance between these almost isochromatic tissues. (4) Finally, the chisel operation may be performed at home or hospital without the cumbersome foot-engine in cases where the rheumatic or other invalided subject is unable to present himself at the office.

The only criticism that I have so far heard concerning chiseling, is made by those who having never made at the attempt, arrive *a priorily* at the conclusion that there is danger of fracturing the root, especially so if it contains a pin. If it be granted the chisel operators that they are just as interested in, and solicitous about the ultimate results, as are the operators employing other instruments, then probably a greater number will take courage and avail themselves of a heatless, quicker, cleaner and generally more convenient technic.

Sealing of the amputated end with amalgam or other materials, I hold as difficult, tedious and unnecessary. It is absolutely contrary to, and tends to destroy the admirable life-work of such men as Callahan, Rhein, Best and others. I cannot look upon it as any-

thing but a compromise for what is known to be the correct procedure. The sealing of the amputated end leaves an infected area between this filling and some point adjoining the pulp chamber, (Figure 1). This canal area varying in length and dependent on the first root filling if indeed there be one.

I am confident that this inaccessible putrescent area can in no wise be beneficial, the converse may result, as a natural consequence. Bearing in mind the histological structure of a tooth—and the probability of the contents of this area gaining egress thru the tubuli, we

Figure 1.

Showing lower second bicuspid with unfilled canal area.

reach the conclusion that teeth to be amputated should have the canals filled before, *not* after the operation.

We haven't limited ourselves as to how far posteriorally to amputate, having successfully amputated every tooth in the mouth with the exception of the superior molors. The reason for this is the rather large cancellated bone area lying between the buccal and palatal roots which is easily invaded by the granulomatous tissue and on account of its position does not reveal itself Roentgenographically; but becomes evident upon cutting down on it. For this reason and not for fear of antral encroachment, which is unwarranted in those versed in regional anatomy, do I hold these amputations contraindicated.

In major surgery the immediate closure of a wound minus a drain, after an infected bone operation is, of course, rarely successful; but in the vascular buccal cavity, and when the curretted area is not larger than the size of a pea we may take advantage of our region and its small size, and suture. Wound areas, however, of larger dimensions should be packed lightly with a 10% iodoform gauze and the dressings changed at least every 48 hours; plus a frequent mouth toilet until the wound, building from the bottom, becomes shallow. To leave the wound unsutured and unpacked may result as my experience has shown, in failure of osseous repair obvious both Roentgenographically and macroscopically.

As to how long an amputated tooth will remain ere it is absorbed or exfoliated is a question that those who answer in a certain number of years (from three to six years is a common prognosis) draw either on their well-intended imaginations, or else accept statistics from *so called* apicoectomies of yesterday.

It is neither a presumption nor an imputation on my part, when I make the statement that amputation operations prior to six or seven years ago were performed under such conditions that any results originating therefrom, have absolutely no bearing on, nor are they worthy of a statistical census purporting to decide momenteous questions. (Figures 2 and 3.) First of all, they rarely employed the Roentgen-ray. Second, the operation was attempted under the too ephemeral gas anesthesia. Third, either no incision whatsover was made or else a crucial incision (this latter incision has no precedent—in all other surgery it has never been resorted to). Then sinking the bur, usually a No. 9, thru gum, periosteum and bone it was blindly circled about in the language of the operators, "as best we could." Purporting to bur away the granuloma root-end and necrosed bone! It probably would do well to quote at this point from Dr. M. I. Schamberg, whose technic today is all that can be desired but who frankly describes his modus operandi of some

years ago. (Items of Interest, March, 1917.)

"Some years ago, fully fifteen to eighteen, when I endeavored to popularize root amputation for the cure of chronic periapical infections, I advocated a means whereby one could perform a rapid surgical ablation of the affected region, including the end or the root, with a large surgical bur. The particular technic employed at that time was intended to make possible this work under the evanescent anesthesia afforded by nitrous oxide."

In the last few years, however, using the above methods as stepping-stones, we are now performing an operation comparatively bloodless and under surgical asepsis; plus the inestimable aid of the Roentgen-ray which enables us to clearly see every step. See the root-end and granuloma, see and smooth the amputated root, see that the wound is free from particles of bone, gutta percha, cement, etc. Then either suturing or packing as indicated above we leave the field in a condition with the assurance that the life of the tooth will be everlasting rather than ephemeral.

Success in apicoectomy depends mainly on the operator's judgment as to whether a case is too far gone for this operation; depends on the sterile technic which embraces not alone the sterilization of instruments but the sterilization of the sheets, towels, hoods, etc. Depends, too, on whether the proper choice of wound closure has been made.

It is not within the scope of this article to dedicate where ionotherapy, apicoectomy or extraction should be instituted; but those practicing ionotherapy exclusively should take cognizance of Dr. Zentler's report (January, 1918, Items of Interest) wherein he points out that after allowing several months to elapse after ionization, the field in three cases yielded streptococcus veridans.

The method we employ in office amputations is as follows: The assistants, fully an hour prior to the patient's appointment, sterilizes all necessary linens, dressings and instruments; prepares the novocain-sup and cyanide solutions. Thus, while we attend to engagements in one room, the next room is being put into readiness. When the patient has been injected with the nov.—sup, our hands are again scrubbed and bathed in

Figures 2 and 3.

Showing partially amputated root-ends of lower central and upper central lateral incisors.

the cyanide solution thereby allowing the anesthetic time to take affect.

The lip is retracted, sterile gauze is placed between the jaws and banking it around the field the patient is instructed to close. Placing gauze between the jaws

Figure 4

Instruments arranged in consecutive order.

obviates most of the unpleasantness incident to the blows of the mallet. The instruments having been arranged from left to right in the order that they will be needed are covered with a sterile towel which is not removed until ready for the incision. (Figure 4.) Picking up the first instrument on the left (a sharp knife) we make a straight, not an inverted crescent-shape, not a crucial, nor a vertical, but a straight transverse incision from three-fourths to one inch in length. (Figure 5.)

Shorter incisions require more retraction are put on a tremendous stretch, are tugged at, and pulled on so that the resulting sequelae are severe pain, tumefaction and delayed healing. The timid operators who are parcimonious when incising, lavish (unconsciously of course) a wealth of post-operative unpleasant events upon their patients, and themselves are hampered by an inaccessible and generally incongruous approach to the field. This pusillanimity extends also to the removal of impacted teeth. I have, myself, been guilty of short and stingy incisions but for some time I have been preferring a sharp, scalpel to an indiscriminate tearing and chewing up of the wound edges.

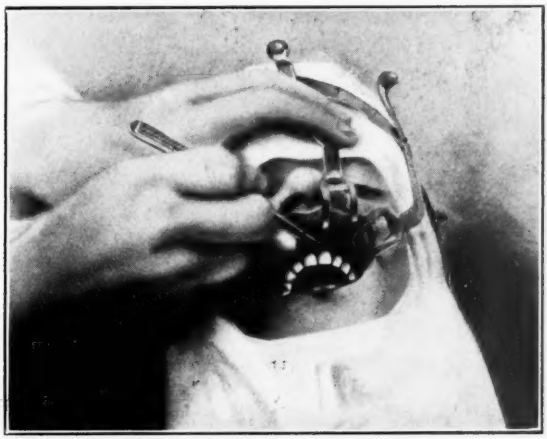
"There are surgeons who operate

upon the 'canine' principle of savage attack, and the biting and tearing of tissues are terrible to witness. * * * * There are other surgeons who believe in the 'light hand,' who use the utmost gentleness, and who deal lovingly with every tissue that they touch. * * * * * The scalpel is, indeed, an instrument of most precious use in some hands a royal sceptre; in others but a rude mattock.

Aside from the fruitless strokes accompanying the use of a dull chisel, the terrible jar that the head received, often leaves the patient with a severe headache. Then, too, the operation is protracted, disarranging our appointment schedule which never allows more than twenty minutes for this operation, including the anesthetic waiting period.

Having removed the outer plate of

Figure 5.



On account of perspective, this straight transverse incision appears as a crescent.

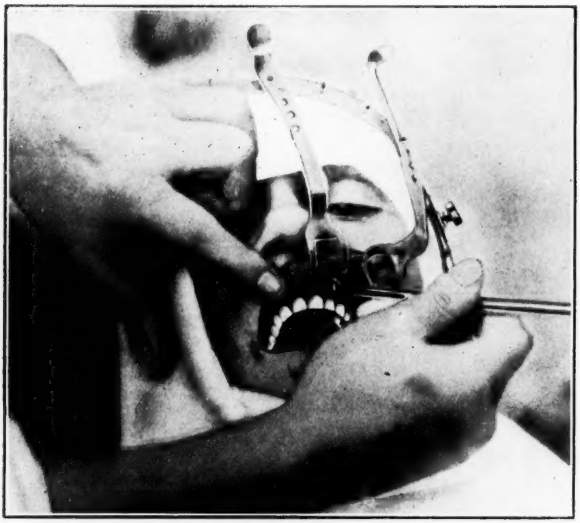
The perfect surgeon must have the 'heart of a lion and the hand of a lady;' never the claws of a lion and the heart of sheep."—Sir Berkeley Moynihan, F. R. C. S.

Retraction of the wound should always be made towards the lip tissue and never towards the crown of a tooth. Having exposed the bone the chisel is then employed to remove the outer plate of bone, but unless sharp chisels are employed(have a dozen or so constantly on hand) it is best not to attempt this method. Of such importance are sharp instruments that I have recently instituted a system which undertakes to fine those in the office, in whose service this rests, when guilty of neglect.

bone, the chisel is then posed at the base of that portion of the root which is to be removed, and is struck a sharp blow with a lead filled steel mallet. (Figure 6.) Often times the apex may then be removed with granuloma attached; failure to do so, however, is of no import usually the walls of this bony nidus will be found affected with condensing osteoitis with an almost polished appearance that it is well to roughen with a curette. (Figure 7.)

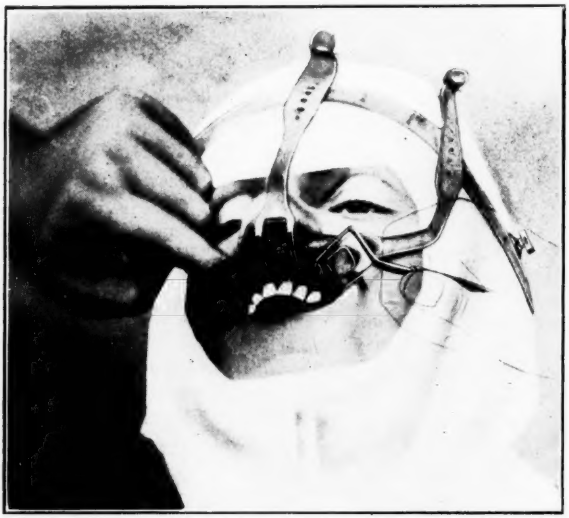
We are now ready either for suturing or packing. (Figure 8.) I deem it not amiss to point out that any medication of this nidus with such strong agents as pure phenol, iodine, and what not, is not

Figure 6.



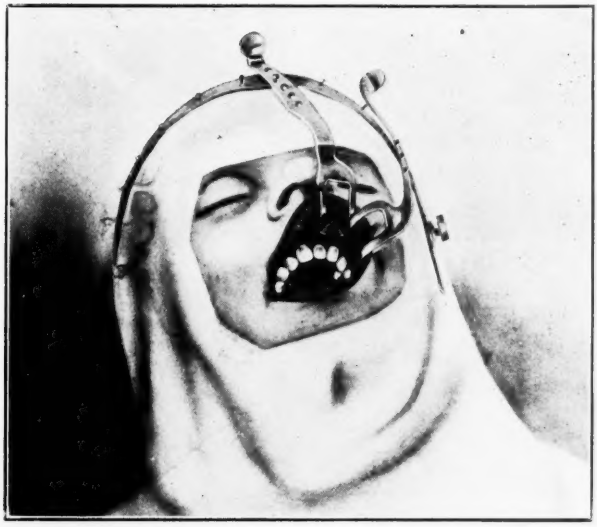
The chisel here was placed distally instead of centrally so as to make the field visible.

Figure 7.



Showing the right-angle curette in use.

Figure 8.

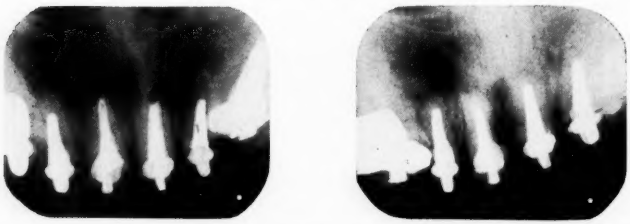


Wound ready for closure.

Figure 9.

Note that in suturing the loose upper tissue is first engaged with the needle, on the lower jaw, the converse is done.

Figures 10A and 10B.

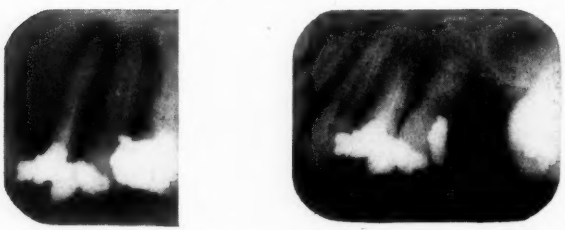


The before and after of a case that involved five anterior teeth. Note osseous construction over amputated ends.

Figures 11A and 11B.

The before and after of the lateral amputation.

Figures 12A and 12B.



The before and after of an amputated first upper bicuspid.

only enpirical and unnecessary; but destructive to the tissues with which they come in contact. If suturing is resorted to, the wound is asked to throw off cauterized tissue along with healing at first intention! It has been said that the dental profession never employs anything in the way of a drug in solutions often seen cases where the gauze packings were discontinued prematurely, followed by an acute inflammation, that in order to treat, we need only to open up and resume packing.

If the operation be carried out as above and the case be Roentgenographed from time to time, it will be found that

Figures 13A, 13B and 13C.

Showing a first lower bicuspid before, immediately after, and three months after amputation.

less than 100% and while this is, of course, an exaggeration, it is not without substance of truth.

If suturing is resorted to fine horsehair (not strong hair such as we use in cleft-palate and hare-lip) is employed in interrupted stitches (Figure 9) and are removed in five or six days. If on account of the large area, gauze is used, it should be changed every forty-eight hours, as above outlined, until the wound becomes so shallow as to be unable to retain the pack. I have yet to see suppuration follow an over-packed wound (in point of time) but I have osseous repair will progress up to a point where no contrast will be noticed in the operated-on-region and the circumjacent bone. (Figures 10, 11, 12, 13.)

The operation here described is certainly the simplest in the realm of oral surgery, and general practitioners with facilities for sterilizers large enough to contain the necessary linens, would do well to perform this operation in their offices. It is infinitely less difficult, less time consuming, than most all other dental operations; and offers, if done properly, a greater percentage of successes.

A STUDY OF THE MICROÖRGANISMS OF DENTAL CARIES.

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THE literature upon the mycology of the mouth is voluminous, yet it contains no work upon dental caries that meets modern bacteriological requirements.

Miller[1] (1880-1890) has carried out the most extensive work done upon the subject of dental caries. He placed teeth in a fermenting mixture of bread and saliva. This he renewed from time to time. He succeeded after three months in producing artificial decay which "could not be told either microscopically or macroscopically from true caries." He demonstrated by zinc crystallization that such a fermenting mixture produced lactic acid. Upon this evidence he originated the lactic acid theory of caries. He strengthened his theory by presenting histological sections of decaying teeth. The bacteria that have the property of fermenting sugar are numerous. Miller had no thought of bacterial specificity in this action. He described a few oral bacteria, such as Leptothrix innominata, B. buccalis maximus, Jodococcus vaginatus, Spirillum sputigenum, Spirocheta dentium, but he himself said, "his bacteriological study upon caries had not been sufficiently extensive or conclusive" to warrant being incorporated into his book. His work was done thirty years ago.

Karolyi, Arkovy,[2] Dobrzyniecki,[3] Siberth, Vignal,[4] Rodella,[5] Goadby,[6] Choquet,[7] and others[8, 9, 10, 11, 12] have either advanced theories based upon bacterial activities, or have carried out bacteriological studies upon the subject of dental caries.

Among these writers Goadby[6] (1902-1903) has done by far the most important work. He has studied the microorganisms of the superficial and the deep layers of decay, and classifies these bacteria as acid formers and liquefiers. He finds that the deeper layers of caries contain a smaller variety of bacteria than do the superficial layers. In the deep layers of caries in twenty cases he finds constantly Streptococcus brevis, B. necrodentalis, and nothing else. In other work he adds to these Staphylococcus aureus. In the superficial decay he finds B. mesentericus, B. furvus, B. Plexiformis, both Staphylococcus aureus and albus, Sarcinæ, and some other forms. He lays particular emphasis on the streptococcus and staphylococcus in connection with caries. Dobrzyniecki[3] (1902-1903) agrees with Goadby in his findings and in his opinions.

Choquet[7] (1900) isolated five organisms from decay beneath fillings. These were not familiar to other workers of his time.

Other students give conclusions concerning the process of caries based solely upon smear examinations; still others upon cultural studies in which the source of the specimens studied has been the saliva or a mixture of the saliva,

tongue scrapings, and tooth scrapings—material remote from the actual carious process.

Kliegler[13] (1915) in his work upon oral microörganisms has made bacterial counts of the material collected from between the teeth, on tooth surfaces, and from carious teeth. He also has described many types of oral microörganisms. In caries he believes that the oral flora changes its character from a streptococcal to an acid-producing rod and a thread flora. He believes that in caries there is a large numerical increase in the oral microörganisms, but that the types actually concerned in the carious process are relatively few.

He describes B. mesentericus, B. putrificus, B. acidophilus (Moro), a nonpleomorphic beaded bacillus, a leptothrix which he believes he has cultivated, and Cladothrix placoides. He says that Goadby's necrodentalis conforms in most particulars to the acid-producing bacteria of Moro, Finkelstein, Rodella, Mereschkowsky, Kendall, and others.

It is evident from this review of the work upon caries that there is no agreement in the bacteriological findings of the various workers.

We have endeavored to study the bacteriology of dental caries more thoroly and more in detail than has been done heretofore. The eighteen hundred children weekly treated for defective teeth at this institution afford at once an example of the need of such a study and an exceptional opportunity for it.

In order to arrive at something definitely conclusive in this work we have studied closely a larger number of cases than have previously been used. In order to be sure that we had under investigation the proper flora we have taken our material for culture from cases where caries is actively progressant. Caries is distinctly a disease of childhood, therefor we have confined our work to children.

For the same reason the sixth and twelfth year molars were selected. These are the teeth most subject to decay; they also furnish more material for study.

Inasmuch as pulp involvement complicates matters by introducing a different type of flora, care was used to avoid including such cases in our statistics. That uniform conditions might be assured, the children selected were of approximately the same age—that is, from ten to fourteen years.

The decay was studied under three different conditions:

I. Because the open carious tooth cavity is exposed to every kind of bacterial contamination, and because this adds confusion to the investigation, an attempt was made to eliminate the incidental invaders. A unique procedure was adopted for this purpose. Fillings were inserted over the bacterial carious mass, care being exercised not to injure this flora in any way. It seemed probable that the extraneous flora would die off, while the flora that had the best hold upon life in this environment would survive. After a period of from six weeks to three months the fillings were removed and the underlying carious dentine cultured.

II. The second condition under which the decay was studied was for the same purpose as the first. Fillings having slight antiseptic properties were placed over the carious tooth substance, but left for a much shorter period. Here we believed that the bacteria that would most readily yield to the effect of the antiseptic would also give way to the more sturdy and vigorous flora intimately associated with caries. In thirty-seven cases, twenty-one had one member of the group, nine had two members, seven had three members.

III. The third manner of studying the carious tooth material consisted of a bacterial examination of the open carious tooth.

In all three procedures the teeth were isolated by the rubber dam, painted with iodine, and the material for study removed with sterile instruments and cultured.

The decayed material was removed in three layers: a superficial, a middle, and deep layer, and later, from the deep dentine that appeared unaffected. Cultures were made from each stratum upon agar, glucose-agar, bouillon, and blood serum. These were grown aerobically and anaerobically.

It was seen that we were dealing with comparatively few organisms, and it was attempted to obtain these in pure cultures. Their morphological characteristics were studied extensively and they were subjected to biochemical and fermentation tests. It was evident from our studies that the constant and predominating flora of dental caries was the closely allied group of microörganisms described by Moro, Tissier, and others. These were found in all the cases of decayed teeth examined and were the prevailing bacteria. In cases that had been under fillings for three months and under fillings with slight antiseptic properties for a shorter time no other microörganisms were found. In the open carious teeth, yeast, Micrococcus catarrhalis, Staphylococcus, Streptococcus, and other bacteria were occasionally found, but there was no regularity in their appearance. Some member of, or the entire Moro-Tissier group, was always found, frequently nothing else. This group is tolerant of higher degrees of acidity than the bacteria above mentioned. It overgrows them in laboratory media. It forms very large amounts of acid. These properties account for the fact that the flora of the open carious tooth is not as varied as might be expected.

Under the first conditions of our study which we have designated as Class I., twenty-seven cases were examined after inert fillings, that had been inserted over carious dentine, had been removed. These specimens were cultivated aerobically. Eight of these contained two members of the Moro-Tissier group, three contained three members, six contained one member. It was rare to find any other organisms present. Ten gave no growth. This does not signify that bacteria were absent from the decay, for the specimens were cultivated only aerobically, and as the growth in the tooth cavity had been under complete anaerobic conditions, without doubt the transition to full aerobiosis was too radical a step. Our other work supports this interpretation. We have never failed to find life in such cases when anaerobiosis was employed. It is admitted that this group grows best anaerobically. B. bifidus is held by some to be a strict anaerobe.

The essential point is that in these cases nothing else was present except members of the Moro-Tissier group.

In Class II, after the removal of fillings containing slight antiseptic properties, the cultured decay of the tooth gave similar results.

Class III, was particularly interesting, for it showed that the flora of the open carious cavity is not varied. On the other hand it is limited.

The acidific group is always present. In some cases nothing else is present and no other microörganisms appear with any regularity.

Of the eighteen cases studied, some member of the group is present in every one. Seven of the cases contain nothing else. Seven contained three members of the group, five contained two members, four contained one and two contained four. Yeast appeared in the superficial layer in seven cases, Micrococcus catarrhalis was found in four cases, Streptococcus in three, and Staphylococcus in three.

It is readily seen from these statistics that the only constant flora in dental caries is included in the Moro-Tissier group. It is equally evident that this is the predominant flora. Nothing else

was present in the cavities that had had the extraneous flora excluded by fillings. Nothing else was present in 38.8 per cent of the open cavities. It is natural to expect this limitation in the types of the flora of dental caries when once its character is disclosed. For this group of microörganisms is known and its high acid-producing character is established. High acidity is not withstood by many organisms, so that the extraneous bacterial life does not here flourish. These microörganisms by their high acid-forming properties possess, in a greater degree than do others, the capacity for at least inaugurating the carious dental process. They form as we shall see further on more than fourteen per cent. normal acid. They soften and produce results upon tooth sections that are similar to tooth decay in the mouth.

Before entering upon the description and classification of these microörganisms that we have found and studied in caries, some of the characteristics of this group may be mentioned. Moro,[14] Tissier,[15] Rodella,[5] Cahn, Passini, Herter,[16] Kendall,[17] Noguchi,[18] and others have done extensive work upon these bacteria and have shown them to be the prevailing flora of the nursling's intestinal tract. The majority of observers have found the aciduric bacteria localized in the large intestine, and only under exceptional circumstances or conditions do they occur in the higher levels of the alimentary tract. Weiss believes that they would appear in the "more acid portion of the tract." Under normal conditions then these microörganisms constitute the flora of the acid intestinal contents of the nursling. Their presence in dental caries has never been previously known.

The presence of B. acidophilus in the mouth has been noted, and Lewkowicz[19] mentions finding B. bifidus in the mouth of nurslings. But the presence of these microörganisms in all dental caries constituting the predominating flora is a matter of interest in view of what has been said and of the statement of Noguchi that "in spite of numerous attempts as yet no one has succeeded in tracing the source of B. bifidus outside of the intestinal tract." Why and how the group occurs in dental caries is not known.

It is natural to expect this Moro-Tissier group to have different characteristics in these two different parts of the alimentary canal, but in the respects of acid tolerence and high acid production they are very similar in both places.

Another thing that has been the subject of much study and discussion in connection with this group of microörganisms is their highly pleomorphic character. Moro continually mentions it. Noguchi has treated the subject in a most interesting manner in an article that gives an account of his study upon B. bifidus. He entitles his work, "The pleomorphism of B. bifidus communis." He says: "The relation between B. bifidus communis and certain other Gram-positive organisms of the feces such as B. acidophilus (Moro), Kopfchen-bacillus, B. tubercular-formis intestinalis (Jacobson), B. infantalis (Kendall) remains unsolved." At present it is difficult to say whether they are entirely different organisms, or whether they are different forms of one and the same organism. He was "able to show B. bifidus to be an anaerobic phase of an aerobic sporagenous organism belonging to the subtiloid group and closely resembling, especially morphologically and biologically, B. mesentericus fucus."

He shows B. bifidus in forms and groupings similar to acidophilus. He shows V-shaped, Y-shaped, fishtail and bifurcating forms, streptococcal and staphylococcal forms, rods and spores. He has been able to modify these and to change B. bifidus by varying degrees of anaerobiosis and aerobiosis from one extreme form to the other.

Noguchi emphasizes the importance

of this interpreting bacterial findings. We have been able to find all these forms in dental caries. We have been able to change them into different and characteristic forms by prolonged cultural work. We have succeeded in producing a sporulating stage from a bifurcating form and in modifying the spore-forming stage to the rod form by changing the aerobic to anaerobic conditions.

The question of pleomorphism has not been confined to B. bifidus. B. acidophilus has also been studied and is constantly termed "highly pleomorphic." Our studies seem to indicate that in the case of this microörganism the pleomorphism has been exaggerated.

The importance of taking this pleomorphism into consideration in the interpretation of bacteriological findings in the study of carious teeth is hard to overestimate. Indeed, the complete lack of attention it has received has obscured the whole of the bacteriological work heretofore done upon dental caries.

The organisms constantly found in dental caries, and belonging as we believe to the Moro-Tissier group because of their highly aciduric character, we have called: Bacillus acidophilus (Moro), Bacillus X, Bacillus M, Bacillus Y, B. bifidus.

Bacillus acidophilus of Moro as found in dental caries is a non-motile, non-pathogenic rod. When grown on agar it is short and thick and measures .75x2 to 3 microns. It is Gram-positive.

On glucose-agar the rods are longer and thinner and more distinctively arranged in groups with the individuals showing parallelism. They produce turbidity of the media. They are Gram-negative. On blood serum the rods measure .1x1 microns. They are Gram-negative, grouped as in glucose-agar.

Bacillus acidophilus grows best anaerobically when first isolated by means of acid broth. In milk it clots the lower portion first. In peptone water it produces no indol or ammonia. In broth it forms a heavy sediment with some turbidity. It forms no gas in sugar. It is a faculative anaerobe and should be transplanted every ten days. It is a high acid former. Most strains ferment saccharose, glucose, lactose, maltose, and raffinose. From seven to ten cubic centimeters of N/NaOH is required to neutralize one hundred cubic centimeters of the bouillon. It does not ferment lactose as readily. According to the studies we have made it is not as pleomorphic as has been supposed. The colonies are slightly raised, round, smooth, opaque, and white.

Bacillus X is somewhat pleomorphic. It is Gram-positive on agar. It most frequently appears as a long chain of short, thick rods, 5x.5 microns, the chains often showing parallelism. Under certain conditions the individuals are considerably longer and do not occur in chains. Moreover, smears of the organism often show only masses of long, tangled, unbroken threads, occasionally having one long thickened end. On glucose-agar many of the individuals fail to retain the Gram stain. It is an anaerobe facultatively aerobic. It produces a high degree of acidity often requiring fourteen cubic centimeters of N/NaOH to neutralize one hundred cubic centimeters of the bouillon. It ferments glucose, saccharose, and levulose, but does not ferment lactose readily. It coagulates milk and does not form indol or ammonia.

On petri dishes its colonies are transparent, round, entire slightly raised.

Bacillus M is a small, slightly curved rod, Gram-positive on agar, Gram-negative on glucose-agar and blood serum. In smears the organisms appear as bent individuals, in pairs, with concave sides facing each other, and in clusters, sometimes joined end to end and thus forming sectors of a circle. It possesses the same high, acid-forming properties as does Bacillus X. It grows best on glucose-agar, on which it forms small, round convex, cream-white to brownish

colonies, the pigment increasing with age.

Bacillus Y is a straight or slightly curved rod with rounded and sometimes tapering ends. It measures from one to two microns X .2 of a micron. The cells are arranged side by side. It is Gram-positive on agar and on glucose.

On blood serum it occurs in the form of rods three to six microns long, and as long, winding threads with a width of .5 of a micron. The ends are frequently thickened. Both rods and threads are Gram-negative and may contain one or more Gram-positive bodies.

This microörganism we have found but one or two times. We have reserved it for future study.

B. bifidus, as it appears in the carious tooth, is to be found in many forms. It is found frequently in its bifurcating state with tapering or with thickened ends, in V and Y forms, in streptococcal forms, as masses of Gram-negative cocci, as straight rods, in crosses and as a spore-former. It is Gram-positive in young cultures. It grows aerobically and anaerobically, altho according to Kendall it is a strict anaerobe. Noguchi shows it to have both anaerobic and aerobic phases. In contradistinction to his, the bifurcating form of our organism grows well aerobically after adaptation to artificial media. The colony is raised, white, entire, butyrous.

Conclusions.

1. The Moro-Tissier group of microörganisms is the constant and predominant flora of dental caries.

2. These closely allied organisms from dental caries present the same morphological features as do those isolated from the intestine of nurslings.

3. Their high acid-forming properties limit the character of the flora found in carious teeth.

4. They possess in a greater degree than do any other organisms, the attributes that are considered necessary for at least inaugurating the process of dental caries.

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OUR PROFESSION'S PATRIOTISM.

By Burton Lee Thorpe, D. D. S., M. D., St. Louis, Missouri.

(Read before the National Dental Association at Its Twenty-First Annual Session, New York City, N. Y., October 23-26, 1917.)

WE MISSOURIANS love our fair state but our Missouri senators have caused us to blush with shame and hang our heads with humiliation at their unpatriotic stand in the United States Senate and their incoordination with the wishes of the President of the United States and the majority of Missouri people.

I refer to our misrepresentatives in the United States Senate, "Gum Shoe Bill" Stone, and "Jim" Reed who, excepting LaFollette, are the two most unpatriotic Americans I know of at this date.

The question has been asked, "What and why is the Preparedness League of American Dentists?"

Briefly, it is an organization of 7,000 dentists of the United States working under the auspices of the National Dental Association who for patriotic and humanitarian reasons by gratuitous service have made dentally fit and eligible 50,000 applicants for enlistment in the United States army and navy, by restoring and making whole and sanitary the wrecked dental apparatus of our soldiers and sailors.

Approximately there is 46,000 dentists in the United States, 7,000 of whom are now members of the League, and every member of the National Dental Association should be. They have made possible this great work undertaken by the League, in proving to the United States government the dental profession were prepared and patriotic, also that the conservation of the teeth of our fighting men is a most valuable adjunct to their health and efficiency. Napoleon said, "An army travels on its stomach" for about three-fourths of a soldier's efficiency depends on his stomach, and a man's stomach cannot perform its functions with an impaired dental equipment.

The League is efficiently officered by Dr. J. Wright Beach, President, who conceived the original idea of it, Dr. H. A. Pullen, Vice-President, who suggested the study course, and Dr. M. B. Eshleman, Secretary-Treasurer, while the whole work of the League is under the supervision of that capable and efficient man, Major Wm. H. G. Logan, president of the National Dental Association, and Chairman of the Committee on Dentistry, General Medical Board, Council of National Defense.

The study course of the League, consisting of 125 units, has opened a much neglected field and has caused many to familiarize themselves anew with anatomy, pathology, anesthesia, radiology, prosthesis, oral and dental war surgery, bone and skin grafting, etc.

Another thing in which the League has accomplished wonders is its work in furnishing ambulances thru various units, dental schools, and dental organizations. All members of the California

State Dental Society are being assessed $5.00 each for this purpose. The Western Dental College of Kansas City, thru the tireless and patriotic work of its Dean, Dr. R. J. Rinehart, is the first dental school to organize a dental motor ambulance unit.

The dental operator, coming in close contact as he does with his patient, has a fine opportunity to explain to his wealthy and patriotic patients the need of ambulances and the work the League is doing, especially calling their attention to the munificence of a patient of Dr. Charles F. Ash, of New York City, who recently gave him $10,000 for motor dental ambulances for the League.

These men working under the League's supervision have proven they are the harbingers of mercy and patriotism willing to make any sacrifice, i. e., the breaking of home ties, many giving up a lucrative practice, accepting an inferior rank, enduring hardships, even the loss of life or limb, if necessary, to follow that glorious emblem, our country's flag, that stands for American ideals, traditions and the institutions of eternal justice and freedom.

The dentists in service in the army or navy did not wait to be drafted but responded with alacrity to their country's call.

Last week in conversation with a member of the President's cabinet in Washington, he said, "The members of the dental corps are doing a great service but if needed they will fight to the death for their country."

Americans have pledged themselves that the Hun with his brutalities and atrocities and the Kaiser with his damned U-boat war, his autocracy and "Kulture," must be wiped out and the democracy of equality and justice the immortal Lincoln predicted that the "government of the people, by the people, and for the people, shall not perish from the earth," but reign paramount and supreme.

For Americans recognize neither autocracy, imperialism, nor aristocracy, except the aristocracy of brains.

Neither do they bow to Emperor, Kaiser, or King, except the Lord God, the King of heaven. (Applause.)

If you have not read the cleverest story the Europeon War has brought forth entitled *"The Three Things,"* by Mary Stillman Andrews, you should. It is a story of a wealthy American lad with snobbish ideas as to caste, religion and race prejudice.

He goes to fight for the Allies and lies wounded among the others on a battlefield in France, deaf from the shriek of shells and boom of artillery, he sees coming out of a cloud of smoke and dust a sad-eyed, hook-nosed figure, dressed in a long black cassock, with a black skull cap on his long white hair.

The old Rabbi works his way among the fallen, peering into faces looking for men of his own race to help.

"Water!" gasped a wounded Irishman and the Rabbi lifted his head and pressed a flask to his lips.

The wounded man saw the black robe and thought the wearer was a priest of his holy faith. His fast dimming eyes made no finer distinctions. "Crucifix," Father, he whispered, "crucifix." The Rabbi started, but from somewhere, somehow a hand held something to the lips of the dying man, whose long fingers caught it, and with the Irishman's heavy head against his breast the Rabbi held high the sign of a faith not his own, before dying eyes, and as he held it another shell burst and the Rabbi lay dead, the dead Irishman in his arms, the cross of Christ gripped in his hand. Illustrating that all faiths are the same in death, and the greatest one of them all is —love.

And that is just what this terrible war has done. It has softened and mellowed humanity, especially the haughty, the vain, the proud, and the wealthy.

It has broken down the barriers of caste, eliminated the snob and has made of mankind, as Kipling says, "little brothers and little sisters under the skin."

There are no class of men engaged in this great war, in whom flows the rich red blood of patriotism, who are doing more to impress and emphasize to our allies the sincere love we have for our country's flag, the sight of which causes a gripping at our heart strings and a flush of pride, than have our dental corps boys in blue and khaki.

So let's "do our bit" every man of us by supporting the League in this fine work. My only criticism of the League is that the membership fee is not ten, instead of one, dollar.

Formerly one seriously asked himself, "Am I my brother's keeper?" but this war has made the world realize that better than being your brother's keeper is that *I am my brother's brother.*

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THE RELATIVE EFFICIENCY OF MEDICAMENTS FOR THE STERILIZATION OF TOOTH STRUCTURES.

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Introduction.

THE existence of bacteria was discovered by Antony van Leeuwenhoek as early as 1675 but it was not until 1860 that their importance as causes of disease was indelibly impressed upon the consciousness of mankind. This was the beginning of antiseptic surgery and the discovery that certain drugs may be used to kill bacteria.

Owing to this discovery, a great impetus was given to literature, not only in the medical profession but also in the dental field, and methods of treating putrescense in pulp canals began to be suggested. However, it was not until 1895, thru the brilliant researches of Miller, Black and Williams, and later Fletcher and many others, that the importance of dealing with root canals of teeth as possible causes of systemic diseases was brought forcibly to the attention of the scientific world.

The importance of this problem,

namely, the relative efficiency of the medicaments for the sterilization of tooth structures, is much greater than has been suspected by either the laity or the members of the dental and medical professions, for the reason that medication has not been doing what we supposed it was. While this topic would include the sterilization of infected tooth structures involved in ordinary dental caries, we have limited the study in this paper to the sterilization of infected dentin and cementum as involved in root canal infection, following the death of the dental pulp. Incidentally, it should be recalled that infection of the dental tissues constitutes not only probably the most universal of all human diseases but by many authors considered the most far reaching in its effects by the production of pain, and primary and secondary lesions. Our problem even when limited to the infected root tissues of non-vital teeth concerns all the members of the dental profession, as well as the patients whom they serve. It should be borne in mind that infected dentin and cementum are the almost universal cause of chronic periapical abscess, and the ultimate cause of the loss of the involved tooth root. This condition of infected dentin and cementum, with or without the assistance of accumulated infection in unfilled root canals, constitutes a contributing cause of a large number of secondary infections and systemic involvements. This is one of the most important unsolved problems connected with the practice of dentistry of today.

It is an exceedingly difficult problem of research to establish means for the sterilization of tooth structures in a way that will be without injury to the surrounding tissues. Our profession has not recognized its failures for several reasons. In the first place the involved tissues are very inaccessible, the approach being thru a small opening which must be followed for considerable distance. The clinical evidence has been exceedingly misleading to both patient and dentist. The criterion of success has been the local comfort and serviceability of the involved tooth. We now understand that these symptoms are not dependable; that the organism which can produce a low grade secondary infection frequently, if not generally, does not produce a local irritation in the primary lesion when these tissues in question are involved; that this infection of the dentin and part of the cementum can exist without apparently influencing the strength of the attachment of the tooth, and indeed, may produce a condensing osteitis which will increase the rigidity of the infected tooth root rather than diminish it. Another difficulty in studying this problem is that of reproducing the conditions involved. This is an important reason why more dependable work has not been done. Observations have been made by many men, as recorded in the dental and medical literature. These have furnished the basis for dental practice. It is important that the literature be reviewed and summarized, which we have, accordingly, herewith, done quite fully.

Historical.

Dental literature contains innumerable articles on the importance of the root canal problem, and many methods for the sterilization or "near" sterilization of this field of infection. Necessary as those first efforts are, they merely approach the ideal. A few of the most important articles are quoted which lead to the present day status.

The first to demonstrate the presence of bacteria in dental tubuli were Miles and Underwood, followed by Miller, who reviewed the researches of the former investigators and corroborated their statements and Sewell in 1885 (1) who wrote extensively on bacteria in dental tubuli. Ingersoll (2), Garretson in 1895 (3), Williams in 1892 (4), Kirk (5), Grieves (6), Buckley in 1911 (7),

Rhein in 1909 (8), Barrett (9), Gorgas (10), Truman in 1896 (11), Abbott (12), Ottolengui in 1914 (13), and others are advocators of different methods of disinfection, while Thoma (14) advises the use of mild antiseptics and urges the operator to perfect his technic.

So many so-called antiseptics, guaranteed to produce certain results, are in use by the dental profession today that no uniform standard is maintained. As a result of this diversity in the treatment of root canals confusion exists and queries from ocean to ocean voice this sentiment. Many writers have seen the lack of standardization in the treatment of root canals, among whom Von Herff in 1915 (15) in his short discussion of the action of the various medicaments used in dentistry, gives reasons for their lack of efficiency, concluding that such standard drugs as iodin, alcohol, bichloride of mercury, cresols and their compounds are all of no account as disinfectants.

Brophy in 1880 (16) states that carbolic acid and creosote have antiseptic, but not disinfecting, powers. He does not quote researches as evidence of this fact, or any references to the effect that these researches have ever been accomplished. LeRoy in 1897 (17) advised deliquescent crystals of carbolic acid in treatment of pulpless teeth.

The following will give a slight idea of the non-conformity to standard methods: Burchard (18) mentions the use of thymol and menthol, dissolved in glycerine as a canal medicament. Bödecker in 1886 (19), in discussing the relative merits of iodoform, makes the following statement: "I fill the pulp chamber loosely with a piece of cotton saturated with the iodoform solution, and temporarily seal it. This plug I allow to remain from three to five days, before I attempt to clean out either the pulp or the root canal." The inefficiency of this method is proven by subsequent experiments in this present research. Rhein in 1897 (20), in discussing the treatment of root canals in abscessed conditions, mentions pyrozone as possessing strong antiseptical properties in the treatment of root canals and canaliculi. An interesting quotation in this connection, contradicting Rhein's statement, is hereby given from McCurdy (21). He ranks iodin, U. S. P., mercuric chloride, and phenol in order of strength and discredits the use of hydrogen peroxide as the following quotation shows: "As a matter of fact, the moment the liquid becomes effervescent, its power to destroy bacteria is ended. As the gas thus produced must push out in every direction, it carries before it not a germicide but an inert bubble. Hydrogen peroxide should not be used in a cavity because of its effervescence, for it distends the tissue and the inert bubbles carry infective germs deeper into the tissues." If experiments proving this point are true, it seems that hydrogen peroxide would then be placed in the rear rank in the dental profession. There are many other methods for root canal treatment which are too numerous to quote.

In order to produce the ideal state of sterilization, no irritation to the tissues must ensue. In this correction Frahm in 1914 (22) claims that the use of solidified formaldehyd, together with a slight amount of cresol, sealed up in a tooth is an excellent method for the production of sterilization. He gives clinical evidence but no researches. But further investigations by Black (23) have shown that formaldehyd and cresol, or any of their compounds, are very injurious to tissue. This suggestion would, therefore, not be an ideal disinfectant.

Dunning (24) states that "complete sterilization is produced within the zone of action by the use of metallic sodium and potassium." There are no proofs mentioned, feasible as this statement may be. This author appreciates the necessity of going further than the immediate zone of action. In this connec-

tion Callahan in 1914 (25), says "We have the testimony of several investigators that it is possible to sterilize the root canal properly, but it is an impossibility to sterilize infected dentin of a tooth while it remains in the mouth." Brophy (16) also claims that carbolic acid and creosote must not be stronger than a five per cent solution on account of the therapeutic action of the drugs, at the same time realizing that these are not disinfectants.

The contributing factors provided by the saliva, which are directly related to the growth of bacteria, have been investigated by Marshall in 1915 (26) and Gies in 1915 (27), in studies on the salivary factor with reference to caries, and Rickert (28) and Bunting (28) have made an extensive study of this factor, in which they give experiments on the structure of individual differences in the teeth leading to the production of caries.

Some writers call attention to the undue stress laid upon the essential oils as disinfectants. Daufresne in 1917 (29) mentions the fact that, under certain, conditions, "bacteria and antiseptic are covered with fatty material which isolates them from each other and permits the bacteria to multiply freely."

There may be a relation existing here between the use of the essential oils as is customary in the practice of dentistry and the action of fat as mentioned above. Further inquiry into this field may elucidate this statement and prove of value in the explanation of the non-bactericidal action of these essential oils.

Boyd (30) gives a complete statement of the present status of root canal problem and Callahan in 1909 (31) briefly summarizes the position of the treatment of root canals in the following quoted statement: "Dr. Broomell (32), of Philadelphia, has recently given us a most excellent and helpful book under the title of 'Practical Dentistry by Practical Dentists.' Under 'Root Canal Treatment' we find fifty-one different procedures, any of which may be thought the best. Under 'Root Canal Filling' we find seventy-one methods for sealing canals and keeping them forever sweet and clean. And yet we are not happy! Under head of 'Treatment of Pulps and Pulp Canals,' miscellaneous, we have sixty-six preparations, each one more potent than its predecessor." Including treatments not here quoted there results a "Total of two hundred and eighty prescriptions and procedures for one poor sick little tooth!" And this was eight years ago!

A great step in the progress of the problem is the importance which nearly every article gives to the bacteriology of handling instruments used in dentistry, and the cleanliness and sterilization of these instruments. Best (33) voices this sentiment. Miller in 1891 (34), Hasseltine in 1916 (35) and Kells (36) believes that no sterile precautions need be used, maintaining that the medicament itself is sufficient to produce perfect results.

The most striking feature which is evidenced in reviewing the literature is the apparent lack of understanding concerning the meaning of the term "Sterilization." There has been considerable confusion in the use of aseptic, antiseptic, disinfectant and germicide and bacteriacide. The general concensus of opinion of bacteriologists, as found in modern works such as Jordan (37), Dorlans' Medical Dictionary (38), etc., places disinfectants, germicides and bacteriacides in the same category. An antiseptic is defined as being antagonistic to a septic state, or as being prohibatory to a septic condition, not necessarily producing sterilization but preventing further growth. To illustrate this point La Odontologia (39) 1913, shows an interesting comparison of the relative merits of antiseptics for use in the mouth, giving a table for the comparison of the amount of time required to produce antisepsis. From this one could not hope

to produce sterilization in the oral cavity but a fairly respectable amount of antisepsis is possible. On the other hand "aseptic" is an ideal state in which no bacteria have ever occurred. For these reasons the only term synonymous with sterilization is "disinfectant."

Dental literature is full of such expressions as "to thoroly cleanse" root canals, to make them "nearly sterile," to "produce good results," to "serve a good purpose," to "have a good effect," and so on. Polet in 1913 (40) claims that the use of iodin, sealed in a canal, will disinfect any pulp debris that may remain in the canal and likewise in the apical region. Albrecht in 1913 (41) advocates the use of resorcin-formalin in root canal treatment for the production of "normal" root canals, probably meaning sterile canals. In this connection Hinman (42) states definitely that, "in the treatment of septic canals, sterilization is accomplished first by washing out the canals with the hydrogen-peroxide bi-chloride of mercury solution. This is followed by the use of Schrier's paste or the potassium sodium compound manufactured for this purpose. It has been found that if the canals are thoroly cleansed with this material that sterilization *is nearly complete* in every case." Further on the author continues, "While I fully appreciate that there is no permanent antiseptic that we know of which may be introduced into the root canals, the iodin in the iodoform, which is set free in contact with moisture, does *serve a good purpose in sterilization.*"

In the search for a disinfectant the use of silver nitrate has claimed the attention of many authors for a long period of time. Prinz (43) gives a complete historical summary of the literature and practical details. Brooks (44) calls attention to the value of this chemical in the treatment of erosion as early as 1854. Taft (45) as early as 1859 expresses himself very favorably on the subject. Harlan in 1898 (46), Truman in 1895 (47) and Szabo in 1902 (48), noticed remarkable properties in the use of silver nitrate in dentistry. Other recent endorsements on the subject come from Stebbins in 1891 (49), Shanasy in 1898 (50), Niles in 1900 (51) and Bryan in 1903 (52). Bethel in 1896 (53) advocated the cataphoric method but the many disadvantages in its use prevented its general acceptance by the dental profession. Preiswerck in 1906 (54) explains this phenomena in the following manner: "The favorable action of the argentic nitrate on the course of caries may be explained by the insoluble combinations which it forms with the organic tooth substance and thus withdrawing the nourishment from the bacteria. We may assume that the chemic process consists in the coagulation of the albumin and the formation of the albuminate of silver oxide. Miller in 1905 (55) has proven that it is the precipitated black silver albuminate which acts principally as the resisting force, and not the silver chloride formed by the action of the silver nitrate upon the sodium chloride always found in animal tissues, which is responsible for the disinfecting powers of the silver combination. Hence, the significance of Black's, in 1908 (56) dogmatic postulate: "Expose the tooth structure treated with silver nitrate to the sunlight until it turns black." Whitslar in 1897 (57) states that cataphoresis drives $AgNO_3$ to the ends of the tubuli. Hartzell in 1912 (58) mentions the prophylactic treatment of silver nitrate in which he says that this medicament can be rubbed into the gums and the roots of the teeth as a prophylaxis three or four times a year.

A step further in the efficiency of disinfectants has been accomplished by Dakin in 1917 (60) when he advocated the use of chlorazene, and later Dichloramin—T (61), in surgical wounds. The two principles of an ideal disinfectant, namely, the killing of bacteria and the

absence of injury to the cell of the living body, also applies to dentistry. Dakin (60) (61), and his co-workers, are accomplishing this aim in surgery. Some practical applications of chlorazene and dichloramin—t to dentistry are stated in this paper.

It is a remarkable fact that the researches in this connection are practically a new field. A deeper insight into literature will reveal numerous references to the lack of such knowledge, and very few investigations, leading to solutions of the difficulty. Dahlgren in 1917 (62) calls attention to the works of Boennecken of 1913 (63) and Blessing in 1914 (64) as a few of the genuine inquiries into this line of research.

Blessing's (64) studies consisted of the use of "Phobrol" (Cresol Preparation), thymol alcohol and aqua regia, which he places in the first rank; antiformin, Perugen and tricresol formalin in the second rank.

Boennecken (63) placed thymol alcohol, chlorophenol, aqua regia and formalin in the first rank, and tricresol formalin, sodium hydrate, phenol, chloral hydrate, balsam of Peru, antiformin and eugenol in order of their efficiency.

As pointed out by Dahlgren (62), both of these authors place a high value upon thymol alcohol and aqua regia. Dahlgren (62) has carried out these experiments still further. He has used fifteen of the most widely used preparations of the present day and in some cases has given two treatments where one did not suffice. In his experiment the teeth were placed in sterilized plaster of paris, infected medium placed in the canals of the teeth in this position, and two treatments were given where one did not produce a sufficient percentage of sterilization. As a result of these experiments, Dahlgren ranks formalin, tincture of iodin, chlorophenol, formocresol and iodin creosote in the first rank, without obtaining one hundred per cent efficiency in any case.

The author emphasizes the importance of further inquiry into the extent to which dentin can be disinfected and the role played by accessory canals, and also points out the necessity of sterilization in the elimination of infection.

To further test the efficiency of present day methods in the treatment of root canals, and to throw more light on the present vague results which follow the use of certain specified medicaments, the following experiments have been conducted during the Spring and Summer of this year at the Research Institute of the National Dental Association.

Outline of the Problem and Our Approach to it.

In attacking this problem we have outlined it as follows:

We have recognized that the following structures and conditions exist as important factors:

First, the pulp canal to which the infection has access and thru which the infection can reach the dentin.

Second, the dentin with its tubuli.

Third, thru the foramen or foramina the infection can reach the cementum, which probably can also be infected from the dentin.

Fourth, the periapical tissues which constitute not only pabulum but also a locked area which may contain an infected culture medium, which may reinfect cementum and dentin and pulp canal contents.

We have arranged our experiments in the following order:

1. A study of the ability of the medicaments to sterilize dentin and cementum under the most ideal conditions, irrespective of compatability with clinical conditions.

2. The study of the ability of the medicaments to even retain the sterility of a medicated dressing when placed in an infected root canal without the influence of a periapical infection.

3. The influence of a periapical infection upon these last named conditions.

4. The ability of medicaments placed within the root canal to sterilize infected dentin and cementum while these tissues are surrounded by a periapical infection, including a study of the areas of these structures that are most readily sterilized.

5. A study of the time factor.

6. A study of Silver-Ammonium-Formalin and Dakin Solutions.

EXPERIMENT 1.

Purpose.—This experiment was undertaken as a rough draft on the efficiency of medicaments.

Materials.—One hundred and ten different medicaments, including the various per cent-dilutions, were used. These are enumerated below:

Oil of Cloves, 5 dilutions
Oil of Thyme
H_2O2 conc.
Beta Naphthol
Oil of Cassia
Dentalone, 3 dilutions
Gaultheria
Alcohol, 4 dilutions
Thymol
Menthol
Lysol, 2 dilutions
Thymol Alcohol
Campho Phenique
Phenol Sodique
$Hg\ Cl_2$
Aqua Regia, 5 dilutions
H_2SO_4, 5 dilutions
HCl, 5 dilutions
HNO_3, 5 dilutions
Phenol, 3 dilutions
Formaldehyd, 6 dilutions
Iodin, U. S. P., 5 dilutions
Chlorophenol
Tri-cresol Formalin
Iodin & Creosote, 5 dilutions
Chloral Hydrate
Eucalyptol
Creosote, 5 dilutions
Copper Sulphate, sat.
Iodoform, Sat. Aq.

Salicylic Acid, in aqueous and alcoholic solutions, and Na, Mg and Quinine Salicylates in aqueous and alcoholic solutions, 32 dilutions.

Three separate series of observations were made for this experiment and each series included ten teeth for each medicament, making 1080 teeth for each of the three series or 3240 teeth for this one experiment.

It proved to be an exceedingly difficult matter to procure a sufficient number of freshly extracted straight rooted teeth, for which reason it became necessary to use for a part of the observations teeth that had been dried and resaturated with moisture and also for some of the observations we sterilized the teeth by boiling on successive days and freshly reinfecting them after saturating them with culture media. We did not run controls to determine whether results were different with freshly extracted infected teeth and teeth which had been reinfected after being dried. However, several sets of teeth are comparable and show practically the same uniformly negative results where the teeth were boiled and infected as where they were known to be freshly extracted infected roots.

A mixed culture of bacteria from the mouths of several persons, producing a heavy growth in one per cent dextrose bouillon broth after two days incubation at 37°C., was used for the first and third series and a pure culture of oral streptococcus isolated in the laboratory, was used for the second series.

Procedure.—The teeth were prepared by cutting off the crowns with a circular saw and opening up the root canals with reamers thru the apex. The air was eliminated from the teeth by placing them under a bell jar attached to the exhaust pump in which condition they were emersed by changing the center of gravity of the bell jar, which dumped them into infected culture media and the atmospheric pressure was restored. They were then placed in the incubator at 37°C, for from four to five days. At the end of this time a medicament was pumped into sets of ten teeth each and

the ten teeth were then submerged in the medicament for 24 hours. The acids received special treatment which will be explained in detail later.

The three parallel series have the following relationship to each other:

Series 1 was to determine in general the relative and actual efficiency of the various medicaments for sterilizing tooth structures which had been contaminated with mixed oral infections.

Series 2 was to determine the efficiency of those medicaments in sterilizing similar tooth structures when the infecting organism was a pure oral streptococcus and to check the technic.

Series 3 was made partly as a control for series 1 and partly to determine whether teeth that were infected in the mouth and freshly extracted would give the same results as reinfected teeth that had been allowed to dry. In this series all the teeth used in the first 71 medicaments or 710 teeth had been freshly extracted.

In the mixed culture no special bacteriological precautions for sterility were taken up to this point. However, after treatment for 24 hours all precautions were used and the teeth taken out of their medicaments and placed in series of tens upon sterile watch glasses. A number of these watch glasses were continuously boiled during the operation of transference and were used to hold the teeth during the next step, which consisted of pumping the canals with water previously sterilized and getting rid of as much of the medicament as possible. Each tooth was then picked up with a pair of forceps flamed before each operation and placed in sterile dextrose bouillon and incubated for 15 days. Results were recorded at the expiration of one, two, three, four, five, six, seven, eight, nine, eleven, thirteen and fifteen days. (See Chart 1).

Each acid was used by immersing the tooth in it in a watch glass and the medicament pumped in for five minutes instead of 24 hours, and then neutralized with a sterilized sodium bicarbonate solution until all chemical activity had ceased. Each tooth was then thoroly washed in sterile water so as not to afford any cause for decrease in growth, by modification of the medium and placed by means of sterile forceps in sterile dextrose broth and incubated for 15 days as mentioned above.

In the second trial, consisting of the pure culture of the streptococcus, the procedure was slightly modified. The teeth were sterilized intermittently for four days in the autoclave at a pressure of thirty pounds for one hour. They were then allowed to incubate for forty-eight hours to test for sterility, after which they were inoculated with the pure culture of streptococcus previously isolated and allowed to grow for four days. A smear proved the exclusive presence of the streptococcus. The teeth were placed in the infected culture medium under a reduced atmospheric pressure as previously described but in this case all the instruments used were sterilized to keep the culture pure.

Difficulty was experienced in sterilizing infected teeth even by repeated autoclaving, B subtilis proving very persistant. After several trials we succeeded in producing an infection of the tooth structure with the single organism-streptococcus from the mouth.

In this series, the same method in general was used as in the previous series except that a smear was made of all tubes which showed growth, to check the infection. In this way it was possible to ascertain whether these tubes contained the culture from the original infection or whether the cloudiness was due to an accidental contamination thru error in the technic.

Results.—Briefly stated, the results of these three series of determinations may be summarized as follows:

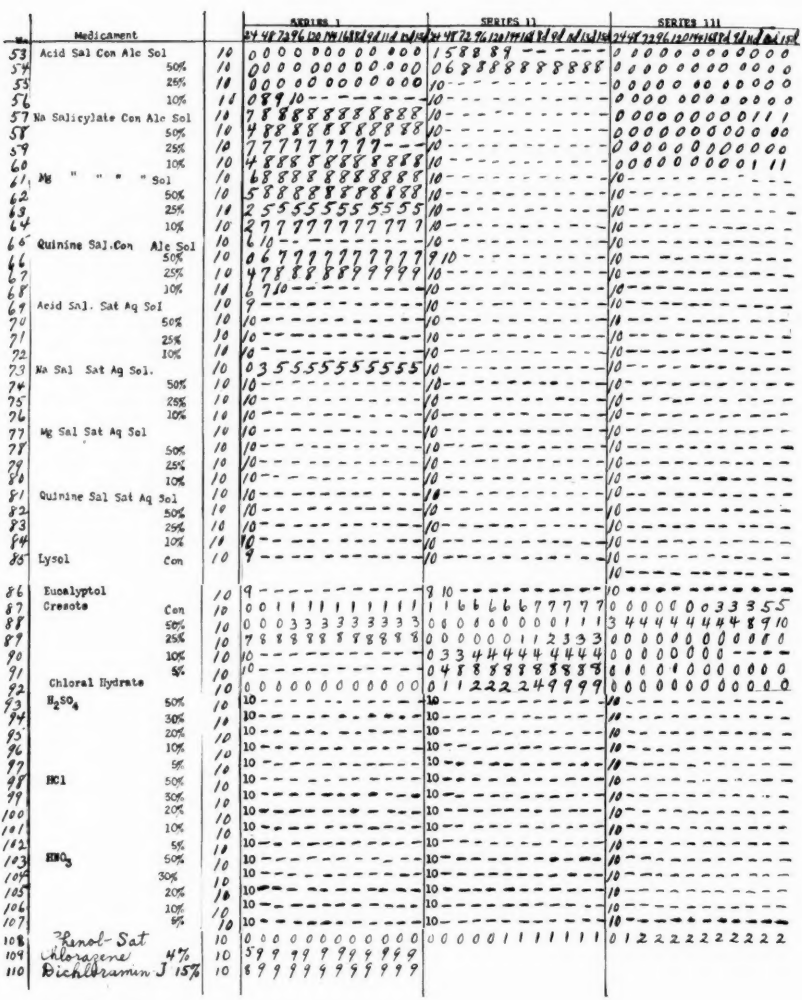
1. Even under ideal conditions where

EXPERIMENT I CHART I

DETERMINATIONS OF THE ABILITY OF MEDICAMENTS TO STERILIZE INFECTED DENTIN AND CEMENTUM WHEN EMERSED IN THEM FOR VARYING PERIODS OF TIME AND THE RELATION OF THE INCUBATION TIME FACTOR TO THE EFFICIENCY.

No.	Medicament		No. of teeth used	SERIES I — HOURS — 24 48 72 96 120 144 168 192 216 240 264 288 312 336 — NO. OF TEETH INFECTED	SERIES II — DAYS OF INCUBATION — 0 1 2 3 4 5 6 7 — 24 48 72 96 120 144 168 192 216 240 264 288 312 336 — NO. OF TEETH INFECTED	SERIES III — 24 48 72 96 120 144 168 192 216 240 264 288 312 336 — NO. OF TEETH INFECTED
1	Phenol	5%	10	0 0 0 7 7 7 7 7 7 7 7 7	0 0 0 0 1 1 2 2 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0 0
2		2%	10	9 10 - - - - - - - - -	1 1 9 - - - - - - - - -	1 7 7 7 7 7 7 7 7 7 7 7
3		1%	10	9 - - - - - - - - - -	10 - - - - - - - - - -	10 - - - - - - - - - -
4	Formaldehyde	40%	10	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0
5		30%	10	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0
6		20%	10	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0
7		10%	10	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0
8		5%	10	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0
9		1%	10	0 0 0 0 0 0 - - - - - -	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0
10	Iodin U S P	7%	10	0 0 3 6 7 8 - - - - - -	0 0 0 0 0 0 0 0 0 0 0 0	7 9 - - - - - - - - - -
11		5%	10	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 - - - -
12		2%	10	0 0 0 0 0 0 0 0 0 0 0 0	0 0 2 2 2 2 2 2 2 2 2 2	0 0 0 0 0 0 0 0 - - - -
13		1%	10	0 0 0 0 0 0 0 0 0 0 0 0	0 2 2 2 2 2 2 2 2 2 2 2	0 0 0 0 0 0 0 0 - - - -
14		0.5%	10	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 2 2 2 2	0 0 0 0 0 0 0 0 - - - -
15	Chloral Phenol		10	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 - - - -
16	Tri-cresol-formalin		10	0 0 0 0 1 2 2 3 3 3 3 4	3 4 8 8 8 - - - - - -	0 0 0 0 0 0 0 0 - - - -
17	Iodin & Creosote	Con	10	0 0 1 3 3 3 3 3 3 3 3 3	10 - - - - - - - - - -	0 0 0 0 0 0 0 0 0 0 4 4
18		50%	10	0 0 2 4 7 5 5 6 6 6 6 6	3 4 4 6 6 7 7 7 7 7 7 7	0 0 0 0 0 0 0 0 0 0 6 6
19		25%	10	0 6 6 7 7 9 9 9 9 9 9 9	0 0 0 0 0 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0
20		10%	10	0 8 10 - - - - - - - -	1 3 3 3 3 4 4 4 4 4 4 4	0 0 0 0 0 0 0 0 0 0 0 0
21		5%	10	0 6 6 6 6 7 7 7 7 7 7 7	0 4 10 - - - - - - - -	0 1 1 1 1 1 1 1 1 1 1 1
22	Copper Sulphate		10	10 - - - - - - - - - -	10 - - - - - - - - - -	10 - - - - - - - - - -
23	Iodoform Sat Aqueous Sol		10	10 - - - - - - - - - -	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0
24	Oil of Cloves	Con	10	0 1 10 10 10 10 10 10 10 - -	1 7 8 8 8 8 8 8 8 8 8 8	0 0 0 0 0 0 0 0 0 0 0 0
25		50%	10	0 0 0 0 0 0 0 0 4 4 4 4	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0
26		25%	10	0 0 0 0 0 0 0 0 3 3 3 3	0 1 1 1 1 1 1 1 1 1 1 1	0 0 2 2 2 2 2 2 2 2 2 2
27		10%	10	0 9 10 - - - - - - - -	0 0 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0
28		5%	10	10 - - - - - - - - - -	0 1 2 2 2 2 2 2 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0 0
29	Oil of Thyme		10	0 0 0 0 0 0 0 0 3 3 3 3	10 - - - - - - - - - -	0 0 0 0 0 0 0 0 0 0 0 0
30			10	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 - - - -
31	H_2O_2		10	10 - - - - - - - - - -	0 0 7 7 7 7 8 8 8 8 8 8	0 3 3 3 3 3 3 3 - - - -
32	Beta Naphthol Oil of Cassia		10	0 0 0 0 0 0 0 1 2 3 3 3	0 0 0 0 0 0 0 0 4 4 4 4	0 0 0 0 0 0 0 0 0 0 0 0
33	Dentalene	Con	10	0 0 1 1 1 1 1 1 1 1 1 1	3 6 6 6 6 6 6 6 7 7 8 8	0 0 0 0 0 0 0 0 0 0 0 0
34		50%	10	0 0 0 0 0 0 0 0 0 0 0 0	0 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0
35		25%	10	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 7 7 7 7 7 7 7 7 7 7
36	Gaultheria		10	10 - - - - - - - - - -	10 - - - - - - - - - -	10 - - - - - - - - - -
37	Alcohol	99%	10	6 6 6 6 6 6 6 6 6 6 6 6	10 - - - - - - - - - -	0 0 0 0 0 0 0 6 - - - -
38		70%	10	5 5 5 5 5 5 5 5 5 5 5 5	10 - - - - - - - - - -	0 0 0 0 0 0 0 0 - - - -
39		50%	10	7 8 9 9 9 9 9 9 9 9 9 9	10 - - - - - - - - - -	0 0 0 0 0 0 0 0 - - - -
40		25%	10	9 9 9 9 9 9 9 9 9 9 9 9	10 - - - - - - - - - -	8 9 - - - - - - - - - -
41	Thymol		10	10 - - - - - - - - - -	1 1 1 1 1 1 1 1 1 1 1 1	9 9 - - - - - - - - - -
42	Menthol		10	0 0 0 0 0 3 3 3 3 3 3 3	2 9 9 9 9 9 9 9 9 9 9 9	0 0 0 7 7 7 7 - - - -
43	Lysol	2%	10	8 - - - - - - - - - -	10 - - - - - - - - - -	0 0 0 0 0 0 0 0 0 0 0 0
44	Thymol Alcohol		10	8 8 8 8 8 - - - - - -	0 0 0 0 0 0 0 0 0 0 0 4	9 9 9 9 9 9 9 9 9 9 9 9
45	Campho Phenique		10	6 10 - - - - - - - - -	10 - - - - - - - - - -	8 10 - - - - - - - - - -
46	Phenol Sodique		10	10 - - - - - - - - - -	10 - - - - - - - - - -	0 0 0 0 0 0 0 0 0 0 0 0
47	Bichloride of Mercury		10	0 10 - - - - - - - - -	2 7 10 - - - - - - - -	0 0 2 2 2 2 2 2 2 2 2 2
48	Aqua Regia	Con	10	9 10 - - - - - - - - -	6 8 8 8 9 9 9 9 9 9 9 9	10 - - - - - - - - - -
49		50%	10	10 - - - - - - - - - -	10 - - - - - - - - - -	10 - - - - - - - - - -
50		30%	10	10 - - - - - - - - - -	10 - - - - - - - - - -	10 - - - - - - - - - -
51		20%	10	10 - - - - - - - - - -	10 - - - - - - - - - -	10 - - - - - - - - - -
52		10%	10		10 - - - - - - - - - -	10 - - - - - - - - - -

EXPERIMENT I.—CHART 1 (Continued).



the medicament bathes both the inner and outer surfaces of the infected tooth structure and even where the mass of the medicament is relatively large and without consideration for the compatability to surrounding tissues, the dentine and cementum were not disinfected except with a few medicaments, namely, formalin in all strengths, iodin 5% and Chlorphenol.

The great majority of the results were negative and in direct contradiction to the general teachings and expectations in current dental practice. These results

EXPERIMENT NO. I.

CHART 2.

Analysis of Chart No. I, Demonstrating the Efficiency of Medicaments for Sterilizing Infected Tooth Structures.

	VARIABLE FACTORS			SERIES I	SERIES II	SERIES III
No.	Medicament	Concentration	Time in Medicament	Mixed Oral Culture—Miscellaneous Teeth	Pure Streptococcus Oral Culture Freshly Extracted Teeth	Mixed Oral Culture—Miscellaneous Teeth
1	H_2SO_4	50%	5 min.	0%	0%	0%
2		30%	" "	0%	0%	0%
3		20%	" "	0%	0%	0%
4		10%	" "	0%	0%	0%
5		5%	" "	0%	0%	0%
6	HCl	50%	" "	0%	0%	0%
7		30%	" "	0%	0%	0%
8		20%	" "	0%	0%	0%
9		10%	" "	0%	0%	0%
10		5%	" "	0%	0%	0%
11	HNO_3	50%	" "	0%	0%	0%
12		30%	" "	0%	0%	0%
13		20%	" "	0%	0%	0%
14		10%	" "	0%	0%	0%
15		5%	" "	0%	0%	0%
16	Aqua Regia	con	" "	0%	0%	0%
17		50%	" "	0%	0%	0%
18		30%	" "	0%	0%	0%
19		20%	" "	0%	0%	0%
20		10%	" "	0%	0%	0%
21		5%	" "	0%	0%	0%
22	Phenol	5%	24 hours	30%	100%	80%
23		2%	" "	0%	30%	0%
24		1%	" "	0%	0%	0%
25	Formaldehyd	40%	" "	100%	100%	100%
26		30%	" "	100%	100%	100%
27		20%	" "	100%	100%	100%
28		10%	" "	100%	100%	100%
29		5%	" "	100%	100%	100%
30		1%	" "	100%	100%	100%
31	Iodin U. S. P.	7%	" "	0%	0%	100%
32		5%	" "	100%	100%	100%
33		2%	" "	100%	100%	80%
34		1%	" "	100%	100%	80%
35		0.5%	" "	100%	100%	80%
36	Chlora Phenol		" "	100%	100%	100%
37	Tri-cresol-formalin		" "	50%	100%	0%
38	Iodin & Creosote	con	" "	70%	60%	0%
39		50%	" "	40%	40%	30%
40		25%	" "	10%	100%	90%
41		10%	" "	0%	100%	60%
42		5%	" "	30%	90%	0%
43	Chloral Hydrate		" "	100%	100%	10%
44	Eucalyptol		" "	0%	0%	0%
45	Creosote	con	" "	90%	50%	30%
46		50%	" "	70%	0%	90%
47		25%	" "	20%	100%	70%
48		10%	" "	0%	100%	60%
49		5%	" "	0%	100%	20%
50	Copper Sulphate		" "	0%	0%	0%
51	Iodoform (Aqueous Sol)		" "	0%	100%	100%
52	Oil of Cloves	con	" "	0%	100%	20%
53		50%	" "	60%	100%	100%
54		25%	" "	70%	80%	90%
55		10%	" "	0%	100%	90%
56		5%	" "	0%	100%	80%
57	Oil of Thyme		" "	70%	100%	0%
58	H_2O_2		" "	100%	100%	100%
59	Beta Naphthol		" "	0%	70%	20%
60	Oil of Cassia		" "	70%	100%	60%

EXPERIMENT No. I (Continued.)

CHART 2.

VARIABLE FACTORS				SERIES I	SERIES II	SERIES III
No.	Medicament	Concentration	Time in Medicament	Mixed Oral Culture—Miscellaneous Teeth	Pure Streptococcus Oral Culture Freshly Extracted Teeth	Mixed Oral Culture—Miscellaneous Teeth
61	Dentalone	con	" "	90%	100%	20%
62		50%	" "	100%	100%	90%
63		25%	" "	100%	30%	100%
64	Gaultheria		" "	0%	0%	0%
65	Alcohol	95%	" "	40%	100%	0%
66		70%	" "	50%	100%	0%
67		50%	" "	10%	100%	0%
68		25%	" "	10%	0%	0%
69	Thymol		" "	0%	10%	90%
70	Menthol		" "	70%	30%	10%
71	Lysol	2%	" "	10%	100%	0%
72	Thymol Alcohol		" "	20%	10%	10%
73	Campho Phenique		" "	0%	0%	0%
74	Phenol Sodique		" "	0%	100%	0%
75	$HgCl_2$		" "	0%	80%	0%
76	Acid Salicylate Con Alc Sol		" "	100%	100%	0%
77		50%	" "	100%	100%	10%
78		25%	" "	100%	100%	0%
79		10%	" "	0%	100%	0%
80	Quinine Salicylate Con Alc Sol		" "	0%	0%	0%
81		50%	" "	30%	0%	0%
82		25%	" "	20%	0%	0%
83		10%	" "	0%	0%	0%
84	Na Salicylate Con Alc Sol		" "	20%	90%	0%
85		50%	" "	20%	100%	0%
86		25%	" "	30%	100%	0%
87		10%	" "	20%	90%	0%
88	Mg Salicylate Con Alco Sol		" "	20%	0%	0%
89		50%	" "	20%	0%	0%
90		25%	" "	50%	0%	0%
91		10%	" "	30%	0%	0%
92	Acid Salicylate Sat Aques Sol		" "	0%	0%	0%
93		50%	" "	0%	0%	0%
94		25%	" "	0%	0%	0%
95		10%	" "	0%	0%	0%
96	Na Salicylate Sat Aqueous Sol		" "	50%	0%	0%
97		50%	" "	0%	0%	0%
98		25%	" "	0%	0%	0%
99		10%	" "	0%	0%	0%
100	Mg Salicylate Sat Aqueous Sol		" "	0%	0%	0%
101		50%	" "	0%	0%	0%
102		25%	" "	0%	0%	0%
103		10%	" "	0%	0%	0%
104	Quinine Salicyl Sat Aqueous Sol		" "	0%	0%	0%
105		50%	" "	0%	0%	0%
106		25%	" "	0%	0%	0%
107		10%	" "	0%	0%	0%
108	Phenol—Sat.		" "	100%	90%	80%
109	Chlorazene	4%	" "	10%	0%	0%
110	Dichloramin—T	15%	" "	10%	0%	0%

have determined the details for the next series of experiments. Before outlining these we give here in full detail the results of the three series.

Chart No. I shows clearly the inhibiting effect of certain agents. Ten teeth being used, it will be noted that frequently it required three or more days before any growth appeared in even a few of the tubes, with other tubes showing growth as days went on. With Oil of Cassia the first growth appeared on the 8th day with pure strep. and with Thymol Alcohol on the 15th day. The pure culture of strep. indicated that it was not a contamination. Iodin and Creosote also showed a marked delay in the growth.

Chart No. II is an analysis of the information in Chart No. 1 with the efficiency expressed in terms of per cent. It shows very strikingly the low efficiency of the acids and the high efficiency of the formalins and a few others. This chart also shows graphically the relative efficiency of different concentrations.

Chart No. III shows all the 100% drugs together and also the same for each range of 10 per cent. Note the greater efficiency for strep. The majority of these drugs appear, however, in the zero group.

While the results obtained in experiment No. 1 are exceedingly important

EXPERIMENT I.—CHART 3.

Results in Order of Efficiency of Medicaments.

SERIES I Mixed Culture	SERIES II Streptococcus	SERIES III Mixed Culture
100%	**100%**	**100%**
Phenol 5% Formalin Conc; 30%; 20%; 10%; 5%; 1% Iodin 5%; 2%; 1%; 0.5% Chlorophenol Chloral Hydrate H_2O_2 Dentalone 50%; 25% Salicylate Conc Alc Sol (acid) 50%; 25%	Phenol 5% Formalin Conc; 30%; 20%; 10%; 5%; 1% Iodin 5%; 2%; 1%; 0.5% Chlorophenol Tricresol Formalin Iodin Creosote 25%; 10% Chloral Hydrate Creosote 25%, 10%, 5% Iodoform Cloves Conc; 50%, 10%, 5% Thyme H_2O_2 Cassia Dentalone Conc; 50% Alcohol 95%, 70%, 50% Lysol 20% Phenol Sodique Salicylic Acid In all concentrations Na Salicylate 50%; 25%	Formalin Conc; 30%; 20%; 10%; 5%; 1% Iodoform Oil Cloves 50% Dentalone 25% Iodin 7%; 5% Chlorophenol H_2O_2
90%	**90%**	**90%**
Creosote, conc. Dentalone, conc.	Iodin Creosote 5% Na Salicylate Conc; 10%	Iodin Creosote 25% Cloves, 25% and 10% Dentalone 50% Thymol Creosote 50%
80%	**80%**	**80%**
	Cloves 25% $HgCl_2$ Beta Naphthol	Phenol 5% Iodin 2%; 1%; 0.5% Cloves 5%
70%	**70%**	**70%**
Iodin Creosote, conc. Creosote 50% Oil Cloves 25% Oil Thyme Oil Cassia Menthol	Beta Naphthol	Creosote 25%
60%	**60%**	**60%**
Oil Cloves 50%	Iodin Creosote, conc.	Creosote 10% Iodin Creosote 10% Cassia

SERIES I Mixed Culture	SERIES II Streptococcus	SERIES III Mixed Culture
50%	50%	50%
Tricresol Formalin Mg Salicylate, alc sol 25% Na Salicylate, sat aqueous sol Alcohol 70%	Creosote, conc.	
40%	40%	40%
Iodin Creosote 50% Alcohol 95%	Iodin Creosote 50%	
30%	30%	30%
Iodin Creosote 5% Phenol 5% Na Salicylate Alc Sol 25% Mg Salicylate Alc Sol 10% Quinine Salicylate Alc Sol 50%	Phenol 2% Menthol Dentalone 25%	Iodin Creosote 50% Creosote
20%	20%	20%
Creosote 25% Thymol Alcohol Na Salicylate Conc Alc Sol 50%, 10% Mg Salicylate Alc Sol conc 50%		Cloves, conc. Beta Naphthol Dentalone, conc. Creosote 5%
10%	10%	10%
Iodin Creosote 25% Alcohol 50%, 25% Quinine Sal. Alc Sol 25% Lysol 2%	Thymol Thymol Alcohol	Sal. Acid Alc Sol 50% Menthol Chloral Hydrate Thymol Alcohol
0%	0%	0%
Aqua Regia, all solutions H_2SO_4, all solutions HNO_3, all solutions HCl, all solutions Phenol 1% and 2% Iodin 7% Iodin Creosote 10% Eucalyptol Creosote 10% and 5% $CuSO_4$ Iodoform Sat. Aqueous Cloves, conc. Cloves, 10% and 5% Beta Naphthol Gaultheria Thymol Campho Phenique Phenol Sodique $HgCl_2$ Acid Salicyl. Alc Sol 10% Quinine Salicylate, Conc Alc Sol Quinine Salicylate, 10% Acid Salicylate aqueous Acid Salicylate 50%; 25% 10% Na Salicylate, aqueous sol 50%, 25%, 10% Mg Salicylate, aqueous sol, conc 50%, 25%, 10% Quinine Salicylate, sat aqu sol 50%, 25%, 10%	Phenol 1% Iodin 7% Eucalyptol Creosote 50% $CuSO_4$ Gaultheria Alcohol 25% Campho Phenique All acids Quinine Sal Con Alc Sol 50%, 25%, 10% Mg Sal Conc Alc Sol 50%, 25%, 10% Acid Salicylate, Na Mg, Quinine Sal Sat Aqueous Sol 50%, 25%, 10%	All acids Phenol 2% and 1% Tricresol Formalin Iodin Creosote con. Iodin Creosote 5% $CuSO_4$ Gaultheria Alcohol 95%; 70%; 50%; 25% Oil of Thyme Lysol 2% Campho Phenique Phenol Sodique All the salicylates except Co Alc Sol Salicylic Acid Eucalyptol $HgCl_2$ All salicylates except Acid Salicylate 50% Alc Sol.

and suggest the measure of our failure to sterilize dentine and cementum the conditions are not identical or even similar to those in the mouth and hence the necessity for making a series of determinations which could be considered as comparable to practice. The divergence of the conditions prevailing in experiment No. 1 from the normal and the details for making a more nearly comparable experiment are suggested by a comparative study of the two sets of conditions as follows:

1. In all these cases where the tooth was placed in the medicament of stated concentration for 24 hours and washed in sterile water and transferred to culture broth, the medicament came in contact with both the inner and outer surfaces of the tooth instead of only the inner surface.

2. The ration of the volume of the medicament to the volume of a tooth is reversed from practice and such that there would be but slight reduction in the concentration of the active agent at any tooth surface.

3. The total amount of the medicament that can be placed in the tooth is exceedingly small, but in the experiment it was very large.

4. There was no adjoining fluid which could remove a part of the active sterilizing elements by diffusion which the periapical fluids do by their contact thru the foramina.

5. There was no mass of infecting medium in such relation to the tooth structure as to promptly reinfect it after a neutralizing or diffusing of the medicament which occurs from the infected periapical fluids.

6. No consideration was necessary of the destruction or injurious action of the medicament on the adjacent or surrounding tissues. Most medicaments that will destroy bacterial cells will destroy tissue cells.

Summary of Experiment I.

It is very difficult to destroy bacteria growing in dentin and cementum.

Experiment II.

Determinations of the Ability of Medicaments to Maintain the Sterility of the Root-Dressing when Sealed in an Infected Root and Without the Perforated Root-Apex Being Immersed in an Infected Culture Medium.

Purpose: This experiment was conducted to show the results of the present-day methods of root canal treatment in scientific terms, and to emphasize for the dental profession the efficiency of the various medicaments which it uses in every-day practice. In this paper there is no emphasis laid on the proper number of treatments, and how many would be needed in each case to show the optimum power of each medicament. It shows merely the inadequacy of the common practice of applying a treatment a certain length of time with the delusion that this may produce sterilization thruout all the tooth structures.

Procedure: A carefully selected number of medicaments which gave promising results in Experiment 1 was used. These are as follows:

Formocresol	H_2O_2
Iodin-Creosote	
Iodin 7%	Creosote
Formalin Conc.	Alcohol 70%
Phenol 5%	Chlorophenol
Cloves 50%	Phenol Comp.
H_2SO_4 50%	Chlorazene 4%
	Dichloramin 15%
Thymol	Phenol Sat.
Mercurophen	
Chloralhydrate	

Two hundred and sixteen freshly extracted teeth were procured and prepared for experimentation as in Experiment I. They were cultured in a mixed salivary infection for from four to six days, when they were ready for treatment. No pure

cultures of bacteria were used and no attention was paid to species of bacteria. There was only one treatment given in each case. A series of five, twenty-four and forty-eight hour treatments, including four teeth for each period of time were run.

In endeavoring to make the conditions as nearly comparable as possible to the conditions as found in the mouth when no periapical infection exists, the following method was used:

The teeth were taken out of the broth infected by saliva and a J. & J. absorbent point, soaked in the medicament was carefully inserted in the root canal down to the apex, under sterile precautions. The entire tooth was then placed into sterile tubes containing a small amount of moistened cotton, and then placed in the incubator for the length of time charted for that series. At the end of that time they were taken out of the test tubes and sterile forceps used to pick out the absorbent point. This was then cut into four pieces with sterile scissors which were carefully flamed between each cutting.

Each piece of cotton was then dropped into sterile tubes of dextrose broth and labeled "A, B, C, and D" respectively from the apical to the crown end of the absorbent point.

Results were recorded at the end of 72 hours. Chart 4 gives a complete record of all positive and negative cultures obtained.

Results: Of the 18 medicaments used for this experiment, only six gave any negative results in cultures; the remainder were all positive cultures in every case for the complete series of hours run. There was only one medicament which produced 100% efficiency and that was Dichloramin-T of Dakin.

The medicaments approaching any degree of sterilization are as follows, in order of five, twenty-four and forty-eight hours efficiency:

	5 Hrs.	24 Hrs.	48 Hrs.
Dichloramin-T	100%	100%	100%
Iodin Creosote	81%	25%	0%
Phenol Compound	81%	50%	0%
Formalin	75%	94%	37%
Formocresol	56%	62%	6%

Thymol, creosote and chlorophenol showed antiseptic but not sterilizing properties.

Several experiments were conducted upon a rabbit's ears to prove whether or not the medicament produces eschars. A subcutaneous inoculation was made with iodin-creosote, phenol compound, dichloramin-T and chlorazene 4% aqueous solution as used in the experiments.

Chlorazene and iodin-creosote produced no eschars but dichloramin-T and phenol compound gave small eschars with a great amount of irritation in the case of dichloramin-T. Probably this was due to the 15% solution used, in the dichloramin trial. One rabbit died instantly from the ear injection of Phenol compound. It is probable that it entered a vein which, however, could not be seen.

Conclusions: The most radical disinfectant was dichloramin-T. This medicament in a concentration of 15% as used in this experiment gave 100% efficiency in all treatments but also produced irritation of living tissue.

A further observation on the lowest percentage needed for root-canal sterilization and the amount of time for the production of this condition will be continued. This drug may, in dilute solutions of 1% or less, be both safe and efficient but it is one of the most painful and destructive agents we have tried in practical cases. *The members of the profession are warned never to place the 15% or even a 5% solution of the Dichloramin-T in oil of Eucalyptol, its solvent, in any tooth or on tissues.*

EXPERIMENT 11 CHART 4

DETERMINATIONS OF THE ABILITY OF MEDICAMENTS TO MAINTAIN THE STERILITY OF THE ROOT DRESSING WHEN SEALED IN AN INFECTED ROOT WITHOUT PERIAPICAL INFECTION

\- Sign indicates Efficiency
\+ Sign indicates Nonefficiency

A = Apical fourth of root dressing.
B = Second fourth from apex
C = Third fourth from apex
D = Crown fourth of root dressing

		Formo Cresol				Iodin Creosote				Iodin U.S.P.				Formalin Conc.				Phenol 5%				Cloves 50%				H_2SO_4 50%				Thymol				Mercuro phen				Phenol Sat.			
Hours	Teeth	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
5	#1	+	+	+	-	+	-	-	-	+	+	+	+	+	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+
	#2	+	+	-	+	+	-	-	-	+	+	+	+	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	#3	+	-	-	-	-	-	-	-	+	+	+	+	+	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+
	#4	-	-	-	-	+	-	-	-	+	+	+	+	-	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
24	#1	+	-	-	-	+	-	-	-	+	+	+	+	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	#2	+	+	+	-	+	+	+	-	+	+	+	+	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	#3	-	+	-	-	+	+	+	+	+	+	+	+	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	#4	+	-	-	-	+	+	+	+	+	+	+	+	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
48	#1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	#2	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	#3	+	+	-	+	+	+	+	+	+	+	+	+	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	#4	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

		Chloral Hydrate				H_2O_2				Cresote				Alcohol 70%				Chloro Phenol				Phenol Comp.				Chlora zene 4%				Dichlor Amin-T 2%				CHECK			
Hours	Teeth	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
5	#1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	+	+	+	-	-	-	-	-	+	+	+	+
	#2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	+	+	+	+	-	-	-	-	+	+	+	+
	#3	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	+	+	+	+	-	-	-	-	+	+	+	+
	#4	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	+	+	+	+	-	-	-	-	+	+	+	+
24	#1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	+	+	+	+
	#2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	+	+	+	+	-	-	-	-	+	+	+	+
	#3	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	+	+	+	+	-	-	-	-	+	+	+	+
	#4	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	+	+	+	+	-	-	-	-	+	+	+	+
48	#1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	+	+	+	+
	#2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	+	+	+	+
	#3	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	+	+	+	+
	#4	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	+	+	+	+

EXPERIMENT III.

Determinations of the Ability of the Medicaments to Maintain the Sterility of the Root Dressing When Sealed in an Infected Root When the Perforated Root Apex IS IMMERSED in an Infected Culture Medium.

Purpose: This experiment was conducted to show the results of the present day methods of root canal treatment in scientific terms, and to emphasize for the dental profession the efficiency of the various medicaments which it uses in every day practice when the tooth root is surrounded by a periapical infection. There is also no emphasis laid on the proper number of treatments, or whether these disinfectants could be brought to produce sterility by a repeated number of applications.

Procedure: From the medicaments which gave the best results in Experiment I the following forty were carefully selected:

Formocresol
Iodin-Creosote
Oil Cloves 50%
Iodin U. S. P.
Formalin
Phenol 5%
Phenol Comp.
Chlorophenol
Iodin-Creosote 10%
Chloral Hydrate
Eucalyptol
Iodoform
Cloves 5%

H_2O_2	Phenol 2%
	H_2SO_4
Oil Cassia	HND_3
Dentalone	HCL
Gaultheria	Mercurophen
Alcohol 95%	Eugenol
Thymol	Cloves
Lysol 2%	Eucalyptol Comp.
Thymol Alcohol	Chlorazene 4%
Campho Phenique	Chlorazene 1%
Creosote	Chlorazene 0.1%
Iodin 0.5%	Alcohol 70%
Formalin 5%	Phenol Sat.
Dichloramin-T 15%	

Six hundred freshly extracted teeth were procured and prepared for experimentation as in Experiment I. They were cultured in a mixed salivary infection for from four to six days, when they were ready for treatment. No pure cultures of bacteria were used and no attention was paid to species of bacteria. There was only one treatment given in each case. A series of five, twenty-four and forty-eight hour treatments, including five teeth for each period of time, were run.

The aim of the experiment was to make the conditions of culture as nearly comparable to the conditions of the mouth as possible. For this reason infected broth was used to culture the teeth after they had received treatment, because a broth containing living organisms surrounding an apex is like the abscessed condition of a peridental membrane in which the tooth in the mouth rests.

The following method was employed: The infected teeth were taken out of the broth and a J. & J. absorbent point, soaked in the medicament was carefully inserted in the root canal of the tooth down to the apex. The crown was then paraffined to the gingival margin and the tooth placed into the test tube containing about 6cc. of infected broth, placed in the incubator according to the length of time charted out for that series.

At the end of the allotted time, they were taken out of the infected broth, dipped into 70% alcohol to wash off the main mass of bacteria on the outside of the paraffin and then placed on a sterile petri dish to dry the exterior. The paraffin was carefully lifted off by slightly melting the gingival margin of paraffin and lifting it with forceps without touching the absorbent point. A sterile forcep was used to pull out the absorbent point which was then cut into four pieces with sterile scissors which were carefully flamed between each cutting. Each piece of cotton was dropped into a sterile tube of dextrose broth and labelled "A. B, C, and D" respectively, from the apical to the crown end of the absorbent point.

Results were recorded at the end of 72 hours. Chart 2 gives a complete record of all positive and negative cultures obtained.

Results: Of the 40 medicaments used for this experiment, only eight gave any negative results; the remainder were all positive in every trial for the complete series of hours run. With the infected medium used in which to incubate the treated teeth no 100% efficiency was obtained. The medicaments approaching any degree of sterilizing ability are as follows in order of five hour efficiency:

	5 Hrs.	24 Hrs.	48 Hrs.
Phenol Compound	70%	15%	0%
Dichloramin-T 15%	35%	5%	0%
Formocresol	34%	0%	0%
Iodin-Creosote	33%	25%	0%
Iodin U. S. P.	10%	34%	0%
Formalin U. S. P.	0%	34%	0%
Phenol U. S. P.	0%	45%	0%
Oil of Cloves 50%	0%	25%	0%

The best of the above results is Phenol Compound prepared according to Buckley's Prescription, but even 70% is not a very high degree of efficiency attained. All of the medicaments showed zero efficiency in a 48 hour treatment, but varied in the per cent of efficiency in the five hour and the 24 hour treatments.

The medicaments not mentioned above all gave zero efficiency in all three of the series of hours, and prove their absolute

EXPERIMENT III CHART 5

DETERMINATIONS OF THE ABILITY OF MEDICAMENTS TO MAINTAIN THE STERILITY OF THE ROOT DRESSING
WHEN SEALED IN AN INFECTED TOOTH WHEN THE PERFORATED ROOT APEX IS EMERSED IN INFECTED CULTURE MEDIUM

\- Sign indicates Efficiency
\+ Sign indicated Nonefficiency

A = Apical fourth of root dressing
B = Second fourth from apex
C = Third fourth from apex
D = Crown fourth of root dressing

Hours	Teeth	Chlora Phenol A	B	C	D	Formo Cresol A	B	C	D	Iodin Creosote A	B	C	D	Iodin Creosote 10% A	B	C	D	Creosote A	B	C	D	Chloral Hydrate A	B	C	D	Eucalyptol A	B	C	D	Iodoform A	B	C	D	Oil of Cloves ½% A	B	C	D	Oil of Cloves 2% A	B	C	D	Oil of Cloves A	B	C	D	Eugenol A	B	C	D	H₂O₂ 3% A	B	C	D
5	1	+	+	+	+	+	−	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	2	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	3	+	+	+	+	+	+	+	+	+	+	−	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	4	+	+	+	+	+	+	−	−	+	+	−	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	5	+	+	−	+	+	−	−	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
24	1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	3	+	+	+	+	+	+	−	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	4	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	−	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	5	+	−	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
48	1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	2	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	3	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	4	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	5	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Hours	Teeth	Oil of Cassia A	B	C	D	Dentalone A	B	C	D	Gaultheria A	B	C	D	Alcohol 95% A	B	C	D	Alcohol 70% A	B	C	D	Thymol A	B	C	D	Lysol 2% A	B	C	D	Thymol Alcohol A	B	C	D	Campho Phenique A	B	C	D	Iodin 1% A	B	C	D	Iodin 2% A	B	C	D	Iodin 0.8% A	B	C	D	Formalin 5% A	B	C	D	Phenol Sat A	B	C	D
5	1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	3	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	4	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	5	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
24	1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	3	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	4	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	5	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
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	2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	3	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
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	5	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Hours	Teeth	Formalin Oxide 5% A	B	C	D	Phenol 5% A	B	C	D	Phenol 2% A	B	C	D	H_2SO_4 50% A	B	C	D	HNO₃ 50% A	B	C	D	HCL 50% A	B	C	D	Mercurochrom A	B	C	D	Eucalyptol-sonc A	B	C	D	Phenol Comp A	B	C	D	Chlorazene 4% A	B	C	D	Chlorazene 1% A	B	C	D	Chlorazene 0.5% A	B	C	D	Dichloramin-T 2% A	B	C	D	CHECK A	B	C	D
5	1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
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	4	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	5	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
24	1	+	+	+	+	−	−	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	2	+	+	+	+	+	−	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	3	+	+	+	+	−	−	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	4	+	−	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	5	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
48	1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	3	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	4	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	5	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

worthlessness in one treatment for so short a period as five hours, not to say anything of the amount of growth which has taken place at the expiration of 48 hours.

A chart in this connection was made which was plotted to contain the percentages of all of the cultures under the various areas of each of the series of hours. In referring to the chart, it will be seen that the highest percentage efficiency is in the areas "C" and "D."

These areas were the ones which did not come in contact with the infected medium and may be explained as not having had a long enough period of time in which the medicament would diffuse with the broth in contact. Aside from this explanation, the factor of accessory canals and tubuli containing bacteria which are not reached by medicament must be considered.

The grand total efficiency counts all negative areas in any one medicament irrespective of areas from which it is taken.

This experiment might have been carried on further by replacing the piece of cotton with a new sterile piece and after 72 hours culturing the sections as the above was cultured. Experiments are now in progress which will show the exact amount of time required to obtain maximum efficiency by giving the medicament every opportunity for producing best results.

Eucalyptol, thymol and creosote show remarkable antiseptic qualities in delaying the growth of bacteria, which, on further incubation produced positive cultures.

Conclusions: Under the conditions specified above, the medicaments used in the previous experiment are not ideal disinfectants for the following reasons:

1. They do not produce 100% efficiency.

2. Formalin and its compounds Dichloramin-T and creosote in strengths used have been shown to produce tissue suppuration.

3. Iodin compounds produce dark stains.

4. The difference between antiseptics and disinfectants was shown in the results obtained from the use of Eucalyptol, thymol and creosote. The interpretation of this experiment is probably that the penetration of the disinfectant is not sufficient to reach the remote and minute recesses of the tubuli.

Having satisfied ourselves that this is a chief reason for non-sterilization of the tooth, it remains to find some disinfectant that will meet with these requirements and fulfill the desired efficiency. This is the subject of the remaining experiments, altho these are not yet completed and require more time.

Experiment IV.

Determinations of the Ability of Medicaments to Sterilize Infected Dentin and Cementum when Sealed in the Root Canal, and when the Perforated Apex is Surrounded by Infected Culture Medium, as per Condition in Experiment III.

Purpose: After the results obtained in the previous experiments it was deemed advisable to determine to what extent the infected dentine and cementum of the teeth have been sterilized by root canal medication.

Procedure: A number of teeth, 63 selected, according to results obtained from the previous experiments were used. These were handled with sterile precautions in the following manner:

They were taken out of the vessels containing them and placed in 95% alcohol for a few minutes and then the surface allowed to dry on a sterile petri dish. All instruments used in handling them were flamed until hot, dipped in alcohol and this again burned off, before and after operation. When dry the teeth were placed one by one between sterile paper and clipped longitudinally in half with heavy plate shears. Cultures were taken from the freshly cut surface with a fine pointed bur, sterilized by flaming before each use. The ten areas from which cultures were taken are as follows:

A. A small amount of the cementum from the apical end, external surface.

B. A small amount of the cementum about 1 m. m. from the upper apex, external surface.

C. The dentin from the inside of the split tooth at the apical end near the cementum.

D. The dentin from the inside of the split tooth about 1 m. m. from the apical cementum.

H. Dentin from the opposite half of split tooth, inside area, apex.

I. Dentin from opposite half of split tooth, inside area, crown region.

J. Dentine scraped from entire surface of pulp canals.

EXPERIMENT IV FIG. 6

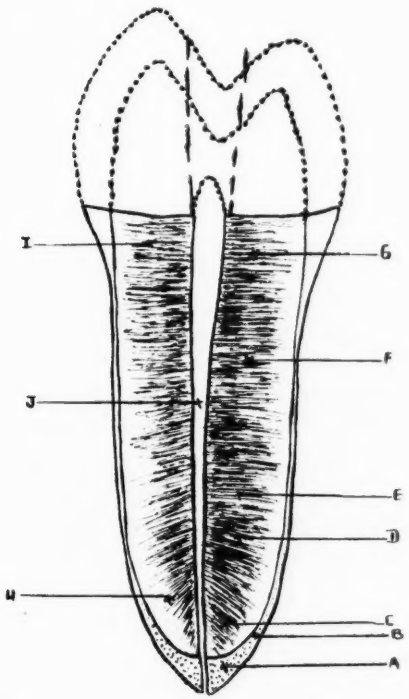

Diagram Showing Areas from Which Cultures of Dentin and Cementum Were Taken.

E. Dentin from the same area about 2 m. m. from apical cementum.

F. Dentin about 1 m. m. from the crown, from inside of split tooth.

G. Dentin from inside of split tooth at crown region.

Figure 6 shows a diagram of a tooth with these areas indicated.

Results: Chart 7 illustrates the results obtained in each individual case. All positive signs indicate growth of bacteria, all negative signs show ab-

sence of growth, therefore efficiency. The areas cultured are lettered from A to J according to the region from which they were taken.

The accompanying diagram gives a more concise idea of these results which were obtained by taking the percentage of all the results obtained under each area respectively not considering the medicament from which each was taken. In no structure or area was the efficiency high.

SUMMARY I.

	Efficiency Per Cent.
A.	17
B.	18
C.	32
D.	18
E.	35
F.	39
G.	46
H.	29
I.	35
J.	15

The second summary, given below shows the results obtained by percentage efficiency of each medicament not considering the areas from which each was cultured. Note the very low net efficiency.

SUMMARY II.

Medicament	No.	Time	Efficiency % for each
Camphophenique	1	5 Hrs.	0
Camphophenique	2	24 "	20
Chlorophenol	3	5 "	13
Chlorophenol	4	24 "	16
Thymol-alcohol	5	5 "	16
Lysol 2%	6	5 "	6
Gaultheria	7	5 "	6
Dentalone	8	48 Hrs.	6
Oil of Cassia	9	5 "	23
Oil of Cassia	10	48 "	0
Formalin 5%	11	24 "	13
Formalin sat.	12	24 "	93
Iodin & Creosote	13	24 "	30
Iodoform	14	5 "	7
Eucalyptol	15	5 "	54
Eucalyptol Comp.	16	24 "	64
Eucalyptol	17	24 "	0

EXPERIMENT IV CHART 6

DETERMINATIONS OF THE ABILITY OF MEDICAMENTS TO STERILIZE INFECTED DENTIN AND CEMENTUM WHEN SEALED IN THE ROOT CANAL. AND WHEN THE PERFORATED APEX IS SURROUNDED BY INFECTED CULTURE MEDIA AS PER CONDITIONS IN CHART V.

−−Efficiency
+−Bacterial Growth

AREA CULTURED		1 Campho Phenic 5 hrs	2 Campho Phenic 24 hrs	3 Chloro Phenol 5 hrs	4 Chloro Phenol 24 hrs	5 Thymo Alcoh 5 hrs	6 Lysol 2% 5hrs	7 Gaulth eria 5hrs	8 Denta lone 48hrs	9 Oil of Cassia 5hrs	10 Oil Cassia 48hrs	11 Forma lin5% 24hrs
Cementum: Apex	A	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + −	+ + +	+ + +
Cementum: 1 mm from Apex	B	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	− + −	+ + +	+ + +
Dentin: Apex	C	+ + +	− + −	+ + −	+ + +	+ + +	− + +	+ + +	+ − +	+ + +	+ + +	+ + +
Dentin: 1 mm from Apex	D	+ + +	− + +	+ + +	− + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +
Dentin: 2 mm from Apex	E	+ + +	+ − +	− + −	+ + +	− − +	+ + +	− + +	+ + +	− + +	+ + +	+ − +
Dentin: 1 mm from Crown	F	+ + +	− + +	+ + +	+ + +	− + +	+ − +	− + +	+ + +	− + +	+ + +	+ − +
Dentin: Crown	G	+ + +	+ + +	+ + +	− + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +
Dentin: Opposite Side: Apex	H	+ + +	+ + +	+ + +	+ + −	+ + −	+ + +	+ + +	+ + +	+ + −	+ + +	+ + −
Dentin: Opposite Side: Crown	I	+ + +	− + +	+ + −	+ + −	+ + +	+ + +	+ + +	+ + −	+ + −	+ + +	− + −
Dentin: Root Canal	J	+ + +	+ + +	+ + +	− + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +

AREA CULTURED		12 Forma lin5% 24hrs	13 Iodin Creso 24hrs	14 Iodo form 5hrs	15 Eucal yptol 5hrs	16 Eucal yptol 24hrs	17 Eucaly ptol 24hrs	18 Chlora zene4% 5hrs	19 Chlora zene4% 24hrs	20 Phenol Comp 5hrs	21 Phenol Comp 24hrs		
Cementum: Apex	A	− − −	+ + +	+ + +	+ − −	+ + +	− + +	+ + +	+ + −	+ − −	+ + +		
Cementum: 1 mm from Apex	B	− − −	+ + +	+ + +	+ − +	+ + +	+ + −	− + +	− + +	+ − −	+ + +		
Dentin: Apex	C	− − −	− − −	+ + +	+ − −	+ + +	+ − −	− + +	− + +	− − −	+ − +		
Dentin: 1 mm from Apex	D	− + −	+ + +	+ + +	+ + +	+ + +	+ − −	+ + +	− − +	− − −	+ − +		
Dentin: 2 mm from Apex	E	− − −	+ + +	+ + +	− − −	+ + +	− − −	− + +	− − −	+ − −	− − −		
Dentin: 1 mm from Crown	F	+ − −	+ + −	− + +	+ − −	+ + +	− − −	+ − −	− + −	− − −	+ − −		
Dentin: Crown	G	− − −	+ − −	− + +	− + −	+ + +	− + −	+ + +	− − −	+ + −	+ − −		
Dentin: Opposite Side: Apex	H	− − −	+ + −	− + +	+ + +	+ + +	− − −	+ + +	+ − +	− + −	− − −		
Dentin: Opposite Side: Crown	I	− − −	+ + −	+ + +	+ − −	+ + +	+ − −	+ − +	+ − +	− + −	+ − −		
Dentin: Root Canal	J	− − −	+ + −	+ + +	+ − −	+ + +	+ + +	+ + +	+ + +	+ − −	+ + +		

SUMMARY II.—Continued.

Medicament	No.	Time	Efficiency % for each
Chlorazene 4%	18	5 "	21
Chlorazene 4%	19	24 "	50
Phenol Comp.	20	5 "	74
Phenol Comp.	21	24 "	46
Total average			27.3

With the exception of formalin which shows 93% sterility, all other teeth show a general infected condition of the tooth structure.

Conclusions: 1. The low percentage of efficiency and the corresponding high percentage of general infection is a very definite proof of the general infection which is found in the teeth.

2. That, with the above medicaments the sterilization of a root canal does not necessarily sterilize the surrounding tooth structures.

3. That the efficiency of a medicament to sterilize all tooth structures should be the criterion of a disinfectant. The criterion of a competent root canal medicament is its ability to sterilize all infected tooth structures.

EXPERIMENT V.

Determinations of the Ability of Double Salt of Ammonium Silver and Formalin to Sterilize Infected Dentin and Cementum when Applied in the Root Canal.

Purpose: The action of formalin as a test for silver has long been known in chemistry but dental application of this fact is probably of recent suggestion by Dr. Howe. (59a). There are frequent references to the toxicity of silver in the last decade. To correlate this past knowledge, test it and observe in experimental medicine whether it would be used as an efficient disinfectant in the treatment of root canals, has been attempted.

Materials: A number of freshly extracted infected teeth, which had been placed for a few days in saline solution were used. The crowns were removed with a circular saw and canals opened, as in the previous experiments.

A 35% solution of silver nitrate, with the addition of NH_4OH until the precipitate has just redissolved, and a 25% solution of formalin was used as a precipitating solution. The method of conveying these solutions to the tooth was by means of a capillary pipette with rubber bulb. Sterilized glass plates were used upon which the teeth lay. A blast of hot air was used for hastening the chemical reaction or precipitation of the silver. A sterile broach was also used to force the medicament to the end of the canal.

Procedure: The teeth were held with sterile forceps and one drop of the silver nitrate NH_4OH solution inserted, and pumped into the canal. Next a drop of formalin was added and likewise pumped into the canal. Hot air was then applied to the canal. This was repeated from three to five times, during a period of about ten minutes. The teeth were then split open as in experiment 3, and under the same conditions as experiment 3 and cultures made from 8 internal areas of the tooth. These areas were as follows:

A. Dentin near apex.
B. Dentin 1 m. m. from apex.
C. Dentin 2 m. m. from apex.
D. Dentin 3 m. m. from apex.
E. Dentin from near crown end.
F. Dentin from opposite side near apex.
G. Dentin from gingival area opposite side.
H. Culture of root canal contents.

The control used on this experiment was taken from the first two sets of teeth in Experiment IV (See Exp. IV, Chart 6). In fact the whole experiment may be considered a control on experiment V.

Results: Four trials were made on four different days. Trial No. 1 contained ten teeth or 80 cultures. These showed contamination in 25 cultures,

making a total efficiency of 69%. Area H, canal contents, however, showed sterility in every case.

Trial No. 2 contained eleven teeth or 88 cultures. These showed contamination in twenty tubes, making a total efficiency of 78%. Area H showed sterility in every case except one.

No. 3 contained six teeth or 48 cultures. These showed contamination in eight tubes, making a total efficiency of 84%. Area H showed complete sterility.

These three trials were deemed not sufficient evidence for the efficiency of this silver nitrate method. Another set of experiments with technic slightly revised, was run. Under the exacting conditions used in No. 4, this series, the following results were obtained:

Ten teeth or 80 cultures were run. Two of these teeth showed contamination in four tubes each. However, these were probably contaminated, owing to a slip from the bur, as they were being ground. The efficiency was 95%.

Further determinations with various modifications of technic must be made of the silver method.

Conclusions: In comparing the results obtained from this method of treatment with the results from other methods obtained as in experiment 3, there is inclination to the belief that a perfected technic will produce sterilization of the tooth structures which are reached by the medicament in so short a period as ten minutes.

In comparing the four trials, the ascending percentages in efficiency leads to this conclusion. The sterility in the cultures obtained from the root canal proves the toxicity and bacteriacidal power of this treatment in the canal itself. The chemical action may be explained as follows:

The addition of the NH_4OH to the $Agno_3$ forms a double silver salt as follows: $AgNO_3+NH_4OH=AgOH+NH_4NO_3$.

The further addition of the NH_4OH gives the following formula: AgOH $NH_4OH=Ag(NH_3)2$ OH.

If formaldehyd is brought into this solution now, the silver is precipitated and deposited as free silver in the following: $Ag(NH_3)2$ OH HCHO=

EXPERIMENT V CHART 7

DETERMINATIONS OF THE ABILITY OF DOUBLE SALT OF AMMONIUM SILVER AND FORMALIN TO STERILIZE INFECTED DENTIN AND CEMENTUM WHEN APPLIED IN THE ROOT CANAL.

\- = Efficiency
\+ = Nonefficiency

A Dentin near apex
B " 1 m.m. from apex
C " 2 m.m. " "
D " 3 m.m. " "
E Dentin near crown end
F " from opposite side near apex
G " " gingival area opposite side
H Culture of root canal contents

	SERIES I											SERIES II											SERIES III											SERIES IV											CONTROL						
Area											No. +											No. +											No. +											No. +						
A	+	+	-	+	-	+	-	-	-	-	4	-	-	-	-	-	+	-	-	-	-	1	+	-	-	-	+	-	2	-	-	+	-	-	-	2	+	+	+	+	+	+							
B	+	+	-	+	-	-	-	-	-	-	3	-	-	-	-	+	-	+	+	+	-	4	-	-	+	-	-	+	2	-	-	-	-	-	+	-	-	1	+	+	+	+	+	+							
C	-	-	+	+	-	+	-	-	-	-	3	-	-	-	-	+	-	-	-	-	-	1	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	0	+	+	+	-	+	-							
D	+	+	+	-	-	+	-	-	-	-	4	-	-	-	-	-	-	-	-	+	-	2	-	-	-	+	+	-	2	-	-	-	-	-	-	-	-	-	0	+	+	+	-	+	+							
E	-	+	-	+	-	+	+	-	-	-	4	-	-	-	+	+	+	+	+	-	+	7	-	-	-	-	+	-	1	-	-	-	-	-	-	-	-	-	0	+	+	+	+	-	+							
F	+	+	+	-	-	+	-	+	-	-	5	+	-	-	+	-	-	-	-	-	-	2	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	0	+	+	+	-	+	+							
G	-	-	-	-	+	+	-	-	-	-	2	-	-	-	-	-	-	-	+	+	-	2	-	-	-	+	-	-	1	-	-	+	-	-	-	-	-	-	1	+	+	+	+	+	+							
H	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	+	-	-	-	1	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	0	+	+	+	+	+	+							
Total	4	5	3	4	1	6	1	1	0	0	25	1	0	0	2	3	2	3	4	2	1	2	20	1	0	1	2	3	1	8	0	0	2	0	0	0	2	0	0	0	4														
	EFFICIENCY = 69%											EFFICIENCY = 78%											EFFICIENCY = 84%											EFFICIENCY = 95%																								

free silver, formic acid and water. Chart 7 will give the details of this experiment.

The toxicity of both silver and of silver nitrate and formaldehyd has been proven on rabbits by making a subcutaneous inoculation.

The sterility obtained from the various cultures of the various areas of the tooth points, also, to sterility of the tubuli themselves. Inasmuch as a uniform treatment was used thruout all of these experiments, no difficulty seems to be encountered, perhaps thru the methods of infection.

EXPERIMENT VI.

Determination of the Ability of Dakin's Recent Chlorazene and Dichloramin-T* Products to Sterilize Infected Dentin as Observed by Inserting Sterile Culture Medium.*

A separate experiment on Chlorazene and Dichloramin-T, consisting of a series of seven different methods for the production of disinfection, was performed.

Six teeth freshly extracted and cultured in a mixed salivary infection were used for each series of the chlorazene experiment and three teeth for each series of the Dichloramin-T experiment. The crowns had been cut off and the root canals opened thru the apex. Two kinds of Chlorazene preparations were used, chlorazene cream obtained directly from the Abbott Laboratories and a four per cent aqueous solution of chlorazene made in the Research Institute Laboratories, kept in a dark bottle in the ice chest thirteen days after preparation. The Dichloramin-T experiment is in the nature of a preliminary report and because of the recent discovery of the drug there has not been time for a complete study, both of its properties and existing results in clinical practice. The Dichloramin-T consisted of a fifteen per cent solution in chlorinated eucalyptol, used on the same day that it was sent us from the Abbott Laboratories. Sterile wooden sticks, sterile capillary pipettes and occasionally a sterile smooth broach were used. All root canals were treated without the use of absorbent points. After treatment, sterile absorbent points were inserted for forty-eight hours, the teeth having been placed into sterile tubes containing moistened cotton and incubated. The ten sets consisted of seven series for chlorazene and three for dichloramin-T.

SET I. One treatment of chlorazene cream was placed in the root canal and incubated for two days. This was then removed and an absorbent point saturated in dextrose broth, inserted. After two more days of incubation the cotton point was taken out, cut into four pieces, and cultured as in Experiments II and III.

Results: All cultures at end of twenty-four hours showed growth.

SET II. One four day treatment of chlorazene cream was given in the same procedure as in Set I.

Results: All cultures at end of twenty-four hours showed growth.

SET III. Four treatments of chlorazene cream on four successive days were given in the same manner as Experiment I.

Results: All cultures at end of twenty-four hours showed growth.

SET IV. One treatment of chlorazene four per cent, aqueous solution, for two days was given. The apical ends of one-half of the teeth were sealed with paraffin to contain the liquid in root canal and the other half unsealed and kept in a vertical position. Procedure same as in previous experiment.

Results: All cultures at end of twenty-four hours showed negative growth. There was no difference in the results with the sealed and the unsealed teeth.

*Chlorazene is a sodium salt of toluene-parasulphochloramin. The systematic name for dichloramin-t is toluene-parasulphondichloramin. J. A. M., Vol. LXIX, No. 1.

SET. V. One treatment of chlorazene four per cent, aqueous solution, was given over a period of four days in the same manner as in Set. IV.

Results: The test tubes showed fifty per cent growth and fifty per cent efficiency.

SET VI. One treatment of chlorazene four per cent. aqueous solution, for six days duration.

Results: The test tubes showed eighty-four per cent growth and sixteen per cent negative.

SET VII. Six treatments of chlorazene four per cent, aqueous solution, on six successive days.

Results: All the test tubes after four days incubation were negative.

Sets VIII, IX and X were made with Dichloramin-T 15% in Eucalyptol. Set VIII received one treatment for 24 hours. Set IX two treatments for 24 hours, and Set X six treatments for 24 hours.

Results are that three sets gave 100% efficiency. This drug, however, cannot be used in this strength as it is exceedingly painful and destructive. Further work must be done with it.

Conclusions: 1. Chlorazene cream in all of the above tests gave no favorable results.

2. Chlorazene cream was not efficient in a two days treatment, improved to fifty per cent in a four days treatment and again declined to sixteen per cent in a six days treatment, which shows the optimum power of efficiency of one treatment.

3. A number of six treatments of chlorazene four per cent, aqueous solution, on six successive days gave one hundred per cent efficiency.

It is not yet ascertained what the minimum number of treatments for efficiency is and how long the chlorazene remains sterile in the root canal.

Altho Chlorazene is advertised as being non-toxic, it was deemed advisable to test the authenticity of this statement. The toxicity and irritating effect on living tissue was tried by making a subcutaneous inoculation in a rabbit's ear with a few drops of Chlorazene. Subsequent observation for several weeks showed no injury of suppuration of any description.

Three teeth from each of Sets II, IV, VI and VII were used for making cultures for the various structures as in Experiment IV.

CHART 8

	Set II Chlorazene cream			Set IV Chlorazene 4%			Set VI Chlorazene 4%			Set VII Chlorazene 4%		
1.	+	+	+	+	+	−	+	+	+	+	−	−
2.	+	−	+	+	+	+	+	+	−	+	−	−
3.	+	+	−	+	−	+	+	+	+	−	−	−
4.	−	+	+	+	+	−	+	+	−	−	−	−
5.	+	+	+	+	+	+	+	+	−	−	−	−
6.	+	+	+	+	−	+	−	+	+	−	−	−
7.	+	−	+	+	−	+	+	+	−	+	−	−
8.	+	−	+	+	−	+	+	+	−	−	−	−
9.	+	+	+	+	+	+	+	+	−	−	−	−
10.	+	+	+	+	+	+	+	+	+	+	+	−

Set VII shows a high percentage of negative cultures and we refrain from overemphasizing the results on account of not obtaining 100% efficiency. More cautious experiments will show the value of this result. The remaining sets coincide with their respective cultural results as stated before.

absorbent points. A new box of these points were opened under sterile precautions, the cotton carefully removed with sterile forceps and the points picked out with flamed forceps and dropped into sterile dextrose broth and placed in the incubator for 24 hours. Five trials were made and each showed

EXPERIMENT VI CHART VIII

DETERMINATION OF THE ABILITY OF DAKIN'S RECENT CHLORAZENE AND DICHLORAMIN-T

PRODUCTS TO STERILIZE INFECTED DENTIN AS OBSERVED BY INSERTING STERILE CULTURE MEDIUM

CHLORAZENE CREAM

	Series #1	Series #2	Series #3
	1 Treat. 48 hours	1 Treat. 4 days	4 Treat. 4 days
Test A	A B C D	A B C D	A B C D
1	+ + + +	+ + + +	+ + + +
2	+ + + +	+ + + +	+ + + +
3	+ + + +	+ + + +	+ + + +
4	+ + + +	+ + + +	+ + + +
5	+ + + +	+ + + +	+ + + +
6	+ + + +	+ + + +	+ + + +
	Efficiency 0%	Efficiency 0%	Efficiency 0%

CHLORAZENE 4% AQUA. SOL.

	Series #4	Series #5	Series #6	Series #7	
	1 Treat. 2 days	1 Treat. 4 days	1 Treat. 6 days	6 Treat. 6 days	CONTROL
Test A	A B C D	A B C D	A B C D	A B C D	
1	+ + + +	- - - -	+ + - -	- - - -	+ + + +
2	+ + + +	+ + + +	- - - -	- - - -	+ + + +
3	+ + + +	- - - -	+ + + +	- - - -	+ + + +
4	+ + + +	+ + + +	+ + + +	- - - -	+ + + +
5	+ + + +	+ + + +	+ + + +	- - - -	+ + + +
6	+ + + +	- - - -	+ + + +	- - - -	+ + + +
	Efficiency 0%	Efficiency 50%	Efficiency 16%	Efficiency 100%	

DICHLORAMIN-T

	Series #8	Series #9	Series #10
	1 Treat. 24 hours	2 Treat. 24 hours	6 Treat.
Test A	A B C D	A B C D	A B C D
1	- - - -	- - - -	- - - -
2	- - - -	- - - -	- - - -
3	- - - -	- - - -	- - - -
	Efficiency 100%	Efficiency 100%	Efficiency 100%

CONTROLS.

The following checks on procedure were made:

1. All media incubated 72 hours minimum after sterilization in the autoclave.

Scissors after flaming gave negative results on four successive trials.

3. Forceps cultured after flaming gave negative results on four successive trials.

4. An interesting experiment was made to prove the sterility of the J. & J. a luxuriant growth after incubation. We have been led to conclude that these guaranteed sterilized points should be sterilized by the operator before subjected to such use as would require the presence of strictly sterilized material.

Where the medicament in use is a disinfectant, the sterility of the points would be accomplished by this agent, but where the medicament is not of such an efficiency, contamination from the absorbent points might result.

5. *Sterility of Medicaments.*

An interesting check on the sterility

of medicaments per se was made by culturing the medicament alone, and by culturing the absorbent cotton dipped into the medicament.

A few drops of the medicament were removed with a sterile pipette which had previously been flamed, and placed in sterile culture broth. The results were negative in every case except nitric acid, sulphuric acid, hydrochloric acid, all fifty per cent, phenol two per cent, and hydrogen peroxide. These showed absolute lack of efficiency. Column 1 gives the results as indicated above.

Absorbent points placed in each of the above medicaments and cultured gave the following results as indicated in column II. The fact that Cloves, 50%; Eucalyptol, Campho-phenique, Iodin 7%, Eugenol, were sterile per se, but when the cotton absorbent points were placed in the medicament, a positive growth ensued, shows lack of efficiency in the production of antisepsis, when a contaminated cotton point was placed in the medicament. Smears were made of medicaments showing growth and results indicated on column III.

According to these data, the above medicaments could have been omitted from the experiments on the evidence of their own lack of efficiency, while the negative production illustrated an important check on the remaining medicaments. These organisms, however, may not be disease producing.

6. All experiments were controlled in order to prove that the cultures were not killed by any other means, as for example, thru their own toxic products. For this reason a culture was made of teeth taken from the same infected media and placed into sterile dextrose broth for the same length of time as the experiment lasted. These cultures all grew out and smears showed the existence of bacteria.

The root canal dressing points used in the previous experiments were autoclaved.

CONTROLS

CHECK NO. 5.

Sterility of Medicaments.

	Col. I Medicament	Col. II Medicament & Cotton	Col. III
Thymol Alcohol	—	—	No Bacteria
Chlorophenol	—	—	
Gaultheria	—	—	
Formalin 5%	—	—	
Formocresol	—	—	
Chloralhydrate	—	—	
Creosote	—	—	No Bacteria
HNO_3	+	+	B
Dentalone	—	—	
Cloves 5%	—	—	
Cloves 50%	—	+	Staph.
Iodin 0.5%	—	—	
Phenol 2%	+	+	B
Iodin 2%	—	—	No Bacteria
Formalin	—	—	
HCL	+	+	B
Iodoform	—	—	
Thymol	—	—	No Bacteria
Lysol 2%	—	—	
Iodin & Creosote 10%	—	—	
Eucalyptol	—	+	G+&B and Spores
Camphophenique	—	+	G+&B
I. & Creosote	—	—	
H_2SO_4	+	+	B
Iodin 7%	—	+	Long Chain B
Phenol Sat.	—	—	
H_2O_2	+	+	Staph.
Alcohol 95%	—	—	
Eugenol	—	+	Staph.
Phenol Sodique	—	—	
Cassia	—	—	No Bacteria
Cloves	—	—	

Staph.=Staphylococcus; B=Bacillus; G=Gram.

General Summary and Conclusions.

1. Infected dentin and cementum are not readily sterilized by medication, even when the amount of medicament is largely in excess of the mass of tooth structure.

2. The medicament contained in a medicated root dressing very readily and rapidly loses its disinfecting power, for the dressing itself becomes infected in a few hours, even from the infected dentin and without being in contact with an infected solution.

3. The medicament in the dressing dissipates more rapidly when one end of the dressing is in contact with an infeced culture medium, such condition as obtains in a periapical infection.

4. The efficiency of a root treatment is greater a few hours after it has been placed in the tooth than after several days, or even one day's time.

5. All areas of cementum and dentin are difficult to sterilize, as well as tend to reinfection, when the medicated root dressing is left more than a few hours.

6. The medicaments that are most efficient, namely, silver nitrate and formalin, are very objectionable, the former by its discoloration and the latter by its destructing and irritating properties, except when used very dilute and for a short time and then quite efficiently.

7. There is much encouragement in the use of Chlorazene and Dichloramin-T products. They are, however, exceedingly painful and destructive in over half of one per cent strength.

8. We now understand why it has been that if a root treatment is left in the tooth for an extended period of time it becomes foul in odor. Also a verification of the observation previously reported by one of us, Price, to the effect that medicated root dressings will always show bacterial growth after they have been left in infected teeth for a few days.

9. These determinations indicate to us that an exceedingly small per cent of the teeth that have been treated by members of the dental profession in the past have actually been sterilized.

10. Nature is, and has always been, very tolerant, and much of the credit that has been taken by, and given to, the dental profession for the sterilization of infected roots has really been due to nature for her kindness in tolerating, at least without local irritation, a probably almost universal and permanent condition of infection, tho in lessened amount, when tooth structures have once been infected and have been subjected to treatment.

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Editorial Department.

THE AMERICAN INSTITUTE OF DENTAL TEACHERS—OUR GRAND ALMA MATER.

More than ninety per cent of the dentists of today have a grand Alma Mater with whom they are not acquainted. Every dentist who has graduated in recent years received better instruction from his particular Alma Mater and is doubtless a better dentist because of the work of this quite industrious, unostentatious grandmother, who has labored for him without ceasing during the past quarter of a century.

This grand Alma Mater—The American Institute of Dental Teach-

ers—was organized on August 18th, 1893, in the Art Palace at the World's Columbian Exposition in Chicago, by the representatives of nine dental colleges. The original stimulus was furnished by Dr. G. V. Black in a paper entitled "Outlines of a Course of Study in Operative Dental Technics," published in the Dental Review in 1888, as a result of which courses in operative technics had been established in several schools. At the meeting of the World's Columbian Dental Congress, Dr. D. M. Cattell read a paper on "Operative Technics," which naturally brought together those who were teaching this subject and furnished the direct incentive for the organization, then called the National School of Dental Technics. Technic courses were established and developed in all schools within a few years. These have come to be a part of the fixed curricula, and little thought is now given to the agencies which brought them into being. Every dentist should appreciate the value of these courses and the student of today must wonder how men learned the technic of operative and prosthetic procedures without this special laboratory instruction.

In 1899, at the seventh annual meeting, the scope of the organization was enlarged to include the consideration of methods of teaching all subjects in the dental curriculum, and the name was changed to the Institute of Dental Pedagogics. Since that time, a large number of teachers, representing the several departments of practically all dental schools of the United States and Canada, have gathered each year to discuss every phase of teaching, the sole object being to give dental students the best possible preparation for their life work.

The organization, with its name changed to the American Institute of Dental Teachers, held its twenty-fifth annual meeting at Pittsburgh the last week in January. The interest centered principally in post-graduate teaching, and war dentistry. Recognizing the demand for thoro-going post-graduate courses, the schools are preparing to extend their service to include short intensive courses for general practitioners and longer courses for those who desire to devote considerable time to special study along certain lines, or to specialize in a single branch of practice. It is likely that a special degree will be conferred for a year of graduate study. The discussions showed that several schools have already aided the government by giving courses to men entering the army dental corps and it was agreed that all should give the present senior classes the special instruction needed for army service. Plans are also being developed for the standardization of the instruments and equipment required by the various schools and the harmonizing of this and the equipment used by the army and navy.

Notwithstanding the difficulties of travel in January, the attendance at the meeting was large, and the active interest manifested signalizes

the work of this body as unique among our many dental organizations. It is entirely devoid of politics or personal aggrandizement; it does its work quietly and earnestly, without acclaim. Most dentists are unaware of its existence, yet it is the directing power for the dental colleges of America, and is today doing more for the advancement of dentistry than any other agency.

Believing that the members of the profession will be interested in the proceedings of the Institute, The Journal will publish during the next few months several of the papers read at the recent meeting.

Universal Military Training

UNIVERSAL MILITARY TRAINING.

By H. H. Sheets, Founder and Director of the National Association for Universal Military Training.

The operation of the draft law has shown the absolute practicability of registering our citizens for service—9,600,000 of them were registered in one day. But of this number fully 80 per cent of the married men have not hesitated to claim exemption on that ground alone, which means that only a small percentage of the married men in the nation can be depended upon to bear arms in defense of it. This is a condition, not a theory, and one which is full of menace, and to which there can be but one answer—the young unmarried men must save this country, even as they saved it in the Civil War.

The following statistics of the ages and number of men of each age in the Union Army in the Civil War, are from the official records of the War Department, and are more eloquent than any amount of argument:

Men 10 to 13 years of age, both inclusive	588
Men 14 to 17 years of age, both inclusive	1,182,452
Men 18 years of age	1,151,438
Men 21 years of age	2,159,798
Men 22 years of age and over	618,511
Men 25 years of age and over	46,626

The outstanding fact of these figures is that the greatest army the world had ever known up to that time was composed of men 21 years old and under, exactly that class which has been omitted—with the exception of those who were 21 on registration day—in the provisions of the draft law.

I do not hesitate to point out this omission in this law, for it is thereby rendered impossible to accomplish the whole task to which it is addressed. This omission has weakened it precisely to the extent that it fails to comprehend the constant source of supply comprised in the potential classes who have arrived at the age of 21 since June 5, 1917, and the unfailing stream of those who will arrive at this age each year henceforth.

Now, of the 9,600,000 citizens registered it is estimated by the office of the provost marshal general 2,000,000 will qualify for military service. The first and second drafts (of 687,00 each,) will total 1,374,000, leaving approximately 626,000 men available for purely military service, which will not be adequate for even a reserve force for the men actually on the firing line. Since experience has demonstrated that three men in reserve

are required for each man on the firing line, it will be seen that 626,000 men will fall short of reserve requirements by some 3,496,000.

This deficiency can be supplied in large part by adopting the following proposed amendment to the draft law, prepared by the National Association for Universal Military Training:

"Amendment.—All male persons resident in the United States who are 19 years of age and not more than 31 years of age on the (date when this amendment shall go into effect), and who were not registered in pursuance of the Act of May 18, 1917, shall be registered at such time and place as the President may by proclamation direct: Provided, That none of the men affected by the law so amended shall be called for active military service before reaching the age of 21 years."

If Congress shall enact this proposed amendment into law, an interesting and illuminating contrast with the figures of the recent registration is at once presented.

The three classes affected June 5, 1918 males 19, 20 and 21 years of age—would total 3,000,000 men (in round numbers, a million men arrived at the age for military service each year), and after rejections on account of physical and mental unfitness, only sons of widowed mothers, etc., would net approximately 1,920,000 men fit for training for military service. This is proof that the nation must depend upon the young, the unmarried men, for defense; for in these three classes there will be a much smaller percentage of exempts than in the more advanced classes of the present draft ages. A comparatively small percentage of men under 21 have dependents, and their mental and physical stamina are not so likely to be impaired by the habits formed at a more advanced age.

In other words, the three classes comprehended in this proposed amendment will produce within 4 per cent. as many men as the ten classes registered June 5, 1917. These three classes could be called into the cantonments for training—by classes and districts—as the cantonments were evacuated by the final increments of the new National Army produced under the registration of last June.

We have expended nearly $500,000,000 on the sixteen cantonments, providing each with light, heat, water, and all necessary sanitary equipment. Each accommodates 40,000 men, and with slight outlay from time to time for paint, repairs, etc., can be made into permanent quarters suitable for use thruout the better part of the year. These sixteen cantonments will provide for the annual class of young men for training purposes each year, and by so utilizing them we would conserve our young manhood and profit by the enormous outlay in labor and money; also we would fit our youth to discharge the duties of citizenship, both civil and military. It is the practical, the rational thing to do.

All of this leads inevitably to the consideration of and preparation for a permanent system of universal military training and equal national service as the fundamental principle of national military policy. The draft law was the first definite step toward this goal; this proposed amendment may well be the second step, and the final step will have been taken when the principle embodied in it shall have become our permanent policy.

Our Regular Army and National Guard are now on foreign soil, or are on the way; the National Guard Reserves have been drafted into the service of the United States, and we are preparing our men of 21 to 30 years of age to follow after them. Yet all these forces will return to civil life under the law, and we will have only a skeleton force after this war is over. Unless the law is amended or a law enacted providing for a permanent military system as above suggested, we will return to our ancient condition

of unpreparedness, and the lesson of this war and its enormous cost will have been wasted.

The time is ripe for legislation along the lines proposed, and the hour is at hand when our citizens must unflinchingly acknowledge the burden of responsibility which is theirs. Congress must provide the means whereby this country will be prepared at all times to defend its sovereignty, and every true citizen must urge the enactment of such laws as will perpetually guarantee it.

"Democracy is not unlike other human institutions—it will not stand merely by its own virtue. If it lacks the loyalty, courage, and strength to defend itself when attacked, it must perish as certainly as if it possessed no virtue whatsoever. Manhood suffrage implies manhood service. Without the acceptance of this principle, democracy is merely an imposture."

Let every true American dedicate himself to the proposition that democracy and service are inseparable.— *Army and Navy Register, issue January 26, 1918.*

TO CONGRESS—THE COMPLETE CASE FOR UNIVERSAL SERVICE.

A vote in congress for universal military service is a vote for the adoption of the only method which will or can give the United States an army.

A vote against universal service is a vote against the maintenance of an army.

A vote for universal service is a vote for the protection of the United States. A vote against universal service is a vote against the protection of the United States.

It is not possible for the facts to be denied or the deductions to be ignored. The logic is unescapable. One of two conditions will be created by congress. The nation will have to accept one or the other and abide all the consequences. It cannot have one thing and call it the other. It may delude itself, but it will be one or the other—protected or defenseless.

It cannot be protected unless it adopts a permanent military policy and accepts universal service. It will be defenseless if it does not.

The matter is open to choice but not to change. Congress can make a decision. The nation must accept the results. These essentials may be distorted in public opinion by hope or illusions, but cannot be altered in fact:

1. An effective military system is the work of years. An army is the product of organization and training. If it is not in being when needed it cannot be had. There is no human power which can produce an army for a nation which needs one if the making begins with the need. It cannot be done. Ten months ago the United States went to war. Its army is still in cantonments being trained. No one can deny this fact. If an army does not exist when needed it cannot be had.

2. The need of an army cannot be determined by the intent of a nation, except in one way—by the adoption and unbroken maintenance of the principle of nonresistance. That is the only way in which a nation may determine beyond all doubt that it will not need an army. It submits to whatever is done to it. It does not resist. It has no will. It has no pride. It does not care. It is too proud or too timid to fight.

3. Nonresistance being the only fashion in which a nation may guarantee that it never will need an army, the nation which says it will assert itself, that it

has pride, that it will not submit, raises in its future the doubt as to whether it will ever need an army or not. Its own intent may not determine that. The intent of another nation may determine it.

4. When the element of doubt has entered, when the intent of another nation may determine, the judgment of that nation will be influenced by the condition of the nation with which it is dealing. If that condition be weak, the intent of the determining nation will be strong.

5. If a nation will resist, if there is any doubt in its future, if another nation may determine for it, it resolves all doubt against itself by not having an army, and when it needs an army it cannot get one. These facts and the deductions from them are unescapable.

6. But, it is insisted, the mood and manners of men will change; new arrangements will be made; this is the last war; human progress is away from war; it is detestable, unnecessary, and unworthy of intelligence; the world will be ordered differently from now on. That may be. We may hope. Generations have had these ideas of a greater good before. Every pacifist hope which now inspires men has inspired men in times gone by. Experience and hope have not traveled the same road before. Probably they will now. But shall we trust to that? Shall the United States place its complete reliance upon the hope that the world will be from now on something that it never has been before? Is that a safe reliance?

7. The adoption of a permanent military policy and the development of national strength will not prevent the coöperation of the United States in any scheme of international peace which may be adopted as practical. That scheme will be stronger if the United States is strong in it. This nation wants peace. The weakness of the nations forming a league of peace will not make the strength of the league.

8. It is contended that the maintenance of armament impoverishes nations and that a league of peace must serve the purpose of reducing this waste and relieving peoples of the burden. In this we are not only justified in considering the case of the United States alone but are obligated to do so. We have had the worst and relatively most expensive military system of all the great nations. The cost of maintaining a proper military establishment would not be a burden. We are so situated that what we do in a military way is not a threat at other nations. In making a situation for ourselves we do not force a situation upon them. We are relieved even of this reproach. We may consider our case on its own merits with relation to our own requirements. We can have an efficient military establishment and get every cent of the money back in the citizenship by-products.

9. The only democratic army is a citizen army. The only efficient citizen army is an army of trained citizens. Therefore we do not believe in a constabulary system of professional soldiers but in an organization of trained citizens. When we speak of an army we do not mean a large body of men devoting their time wholly to military duty but a much larger body of citizens organized, equipped, and trained, but engaged in their civilian duties. The organization remains in being. It can mobilize and direct the men when they are needed. Thus the army is in being and the soldiers are civilians.

10. The adoption of this system does not make a nation a militarist nation. The bricklayer who has had military training is no more anxious for war than the bricklayer who has had no training. The difference between training and lack of training in the clerk, the butcher, the lawyer, the railroad man, the doctor, school teacher, grocer, teamster, merchant, carpenter, etc., is a difference

expressed in the ability to meet a need of war, not in the inclination to find an excuse for one. A militarist nation is made by the wedding of military and political powers, by the framing of foreign policies by a military caste, by the imposition of this caste, its ambitions, purposes, and ideals upon a people. The United States has no such caste and would not have one in its politics.

11. If we ever need an army, a need at which we can only guess, a need which we cannot determine and may not control—we shall not have an army unless we adopt a policy which provides one, and the only safe, economical, profitable army is one which depends upon trained citizens.

12. To get this army all that is needed now is for congress to vote that young men of 19 years hereafter shall give a certain part of their time, even as little as six months, in cantonments already erected, with equipment already bought, under officers already trained, in an organization already established.

13. This scheme has been established and paid for. All it needs is the time of young men. The cost of maintenance would be repaid in the physical survey the youth of the nation would obtain, in the discovery and correction of physical ills and tendencies and mental defects, in the improving of national stock, in the quickening of the social sense and in the imposition of social discipline, in the stimulating of national idealism and patriotism, in the betterment of the bodies of the young men, in the heightening of their conception of national obligations and citizenship duties.

This is the scheme for which congress will vote and which it has the opportunity to establish. It will guarantee the security of the United States and elevate its tone. It is not costly and is not an imposition. It will interfere with no peace plans. It will strengthen them. It will resolve all doubts in favor of the United States and make Americans masters of themselves.—*Editorial Chicago Tribune.*

AS TO UNIVERSAL MILITARY TRAINING.

Enthusiasm in favor of universal military training is being aroused among observers in the United States, who see that it is having favorable effects upon the health of the young men who are now coming under the operation of the system. Regular physical exercise, combined with sufficient sleep, takes off the superfluous adipose tissue and produces a springy step and clear eye. Moreover, the medical examination to which thousands are being subjected is resulting, in many instances, in the removal of minor defects which, while not preventing men from performing their daily work, were nevertheless a detriment to the proper enjoyment of life.

These things are all to the good. But there is another side to the picture, as is shown by the experience of Germany. Universal military training might easily come to be indistinguishable from universal compulsory military service. Do democracies want that? On the contrary, they are now fighting to make this a world in which nothing of the sort will be needed. The root evil of militarism is its tendency to put the Army above the civil authority. It exacts obedience to superior officers in times of peace as well as in war. Its ideal is a world where the court martial is superior to the ballot box.

Most of what is good in the idea of

universal training can be obtained without the introduction of more than a modicum of the military element. There is a widespread opinion that regulated and compulsory physical exercises, suited to individual needs, should be a feature of all our schools. Also the medical care of children, with a view to curing small defects before they become serious, could, with advantage, be made much more nearly universal than it is at present.

But these improvements should not be accompanied by any diminution of the spirit of personal freedom. Citizens of a democracy must be left to act in public affairs according to their best judgment. If the "common sense of most" does not prove sufficient for political salvation, there is no help for it. — *Army and Navy Register, issue January 26, 1918.*

FOR UNIVERSAL MILITARY SERVICE.

In spite of the thousand and one lessons the country is getting in the most direct fashion, it is not to be expected that it will apply its experience for its future needs unless its inertia is attacked persistently.

The folly of a military policy which does not keep trained men in readiness has been demonstrated. The country has been forced to rid itself of inertia and raise an army. If it is allowed to be contented with emergency measures for emergency purposes, its condition five years from now will be precisely what it was six months ago.

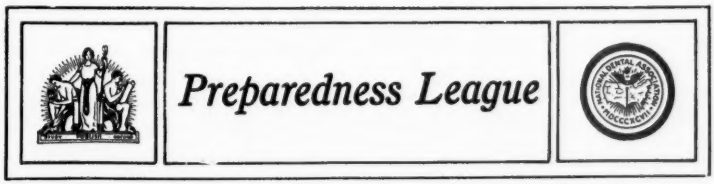
Its condition may be even worse after the war than it was before. Before the war the demand for universal service was increasing because there was a growing fear that the United States could not preserve peace by having peaceful intents. After the war the nation will be disposed to rest and take breath, to recover from war taxation and nurse its wounds.

The disposition will be to regard the disagreeable business as done with forever. Inertia will control again, and pleas for wiser methods will not be effective. We can easily imagine what the mood of the nation will be after the war. It will have had enough and more than enough of war preparations. In its weariness it will be more difficult to arouse, in spite of its experience, than it was before it had the experience.

In fear of this, it must be urged that the next congress take advantage of the most acceptive mood the people can be found in—that of war energy. This is the year in which to give the United States a military establishment which takes young men of 19 years and gives them a training which will fit them for service.

The nation will accept legislation creating such an establishment now. Once established, it will be maintained. It will be accepted as a necessary part of the life of the nation.

If the opportunity of this year be lost, the discouraging, uphill work of arguing against popular indifference will have to be resumed, with the most uncertain prospects. Experiences will be forgotten, Delusions will return to power, and the United States will be no stronger and no better protected than it has been.



RHODE ISLAND HEADQUARTERS.

Office of the Rhode Island Dental Director, State House, Providence.

To the Rhode Island Council of Defense:

Gentlemen: The following is the report of the Rhode Island Dental Director of work performed by Rhode Island volunteer Dentists:

At the time of the mobilization of the several State Military organizations as ordered by President Wilson in June, 1916, the officers of the Rhode Island Dental Society felt that something of a material benefit could be obtained if the members of the Dental Profession of the State were allowed to visit Camp Beeckman at Quonset Point, R. I., where Battery A, Field Artillery, Troops A, B, C and M, Cavalry and the Ambulance Corps R. I. N. G. were to be stationed.

A committee was appointed by the President of the society to confer with the commanding officer, then Capt. T. A. Roberts, U. S. Cavalry, as to the best methods to be pursued. Capt. Roberts was very enthusiastic concerning the project and many times displayed his enthusiasm by his suggestions to the Committee and orders to the officers of the several military organizations.

The effort of the volunteer dentists at that time was amply repaid as splendid results were obtained in the very few days the men were in the Home Camp. A full report of this work was made at the regular meeting of the Dental Society in July, 1916.

A letter from the Adjutant General at Washington to the Chairman of the Committee, stated that the Secretary of War directed him to express his appreciation of the spirit and work of the Society.

At the regular quarterly meeting of the Society held March 30, 1917, the following resolution was introduced and unanimously adopted, namely:

Whereas, the dental work performed by members of the Rhode Island Dental Society upon the State Troops at Camp Beeckman last July, showed that the mouths of the enlisted men were greatly in need of dental attention, and

Whereas, the members of the Rhode Island Dental Society realize the grave situation in which the country is placed. Therefore be it

Resolved, that the Rhode Island Dental Society offers to the State of Rhode Island the services of its members for the purpose of attending to the immediate and necessary dental needs of the Rhode Island Troops as soon as they are mobilized.

That a committee be appointed by the President of the Rhode Island Dental Society to facilitate the working out of

the plan, with the power to carry on the work as seems best to the committee.

That a copy of these resolutions be forwarded to His Excellency, R. Livingston Beeckman, Governor of Rhode Island.

That the said committee confer with the Governor and other State Officers as to the best means of carrying on the work.

The President appointed the chairman of this committee with power to add to it at his own discretion.

This resolution stated specifically what this committee should do, and it endeavored to carry out the instructions.

Within a few days a Battalion of Coast Artillery consisting of the 2nd, 5th, 12th and 15th Companies were ordered on duty under command of Major Johnson. Detachments were stationed at many points thruout the State, at the several railroad bridges, reservoirs, pumping stations, etc.

The committee held conferences with Major, now Lt. Col. Johnson, who seemed anxious that his Battalion be put in good condition, as far as their teeth were concerned and assisted the committee in every way he could.

Examination charts and blanks were purchased by the committee and on Sunday, April 22, every man in the Battalion was examined and a careful record made of conditions as found.

These records were tabulated and the following results were obtained:

Number of men examined	407
Teeth needing immediate attention	2687
Teeth or roots to be extracted	407
Number of mouths in good condition	16

This examination proved to the committee the deplorable condition of the mouths of the men and they considered it would compare favorably with the conditions as existing thruout the entire United States. If such were the case, it would be a physical impossibility to correct this misfortune even if every one of the dentists of the country were to try their best, as Congress had already authorized the raising of an army of approximately 2,000,000 men, this army to be increased from time to time.

By an act of Congress in 1911, the several States were authorized to commission Dental Surgeons in their National Guards, but Rhode Island had neglected to do so.

It was impossible to make an appointment with His Excellency, Governor Beeckman, until May 14th. The Committee waited on the Governor on that date and enjoyed a conference with him. Governor Beeckman was, and is, deeply interested in this work, and showed his interest at once.

One of the suggestions to him was the commissioning of Dental Surgeons to the National Guard at the earliest possible moment. He asked the Adjutant General of Rhode Island to proceed in the regular way to have such commissions issued.

It is a pleasure to report that three dentists were commissioned and have been mustered into the Regular Army as 1st Lieutenants, namely, Drs. Wm. Clegg, Raymond L. Webster and Ralph H. Hankins.

On July 25th the 20 companies of our Coast Artillery were mobilized at the several fortifications in Narr. Bay, at Boston and New Bedford. The three batteries of Field Artillery, four troops of Cavalry and Ambulance Corps mobilized at Camp Beeckman.

The same congenial and interested commanding officer was again stationed at the Camp, but as Maj. T. A. Roberts, he having been promoted during the year, again discommoded himself many times to assist the Committee. The men of the several commands were examined and careful records and charts made, 1200 all told.

Knowing that Lieut. Clegg would be stationed temporarily at Camp Beeckman, the Major requisitioned from Washington a complete dental outfit and supplies at the request of the committee. The Dental chairs and brackets belonging

to the State were transported to Camp by the Quartermaster's Department.

Lieut. Clegg was ordered to report to the Commanding Officer on Thursday, August 9th. On August 10th the Committee was informed that conditions were such that the volunteer dentists could begin actual work, that there would be no work on Saturday afternoon or Sundays.

Much work was accomplished and was greatly appreciated by the officers and men.

During the year 1916 the Preparedness League of American Dentists was organized and grew very rapidly under the auspices of the National Dental Association.

At the time of the declaration of war in April, 1917, this organization had grown to such proportions and had so far extended its influence thruout every State in the Union that it was recognized by the Washington authorities as the most logical organization to represent the Dental Profession in the Council of National Defense.

A local unit of 67 members was formed in Providence and for several weeks very interesting meetings were held at the Providence Public Library. Lectures and practical demonstrations were given, special attention being paid to War Surgery and its kindred subjects as suggested by the Surgeon General's office at Washington.

During the first part of September, 1917, 1st Lieut. W. A. Heckard. D. R. C., was detailed by the Surgeon General of the United States Army to have direct supervision of all dental work to be done by volunteer dentists for selected men of the National Army.

A Dental Director was appointed to each of the Military divisions of the country and also one director for each State. One of the duties of the State Director was to thoroly organize the dentists of the State and obtain from them a pledge of at least one hour's time a day to be given to the drafted men. This service to be given only after all claims of exemption were waived or denied and the man had been certified to the Adjutant General of the State.

The Rhode Island Director was appointed in September, 1917.

During the first part of October, I was instructed by the Surgeon General's office at Washington to confer with His Excellency, Hon. R. Livingston Beeckman, Governor of Rhode Island, present the plan of the War Department and ask for his assistance and support. I had a very delightful interview with our Governor who was very much interested. He placed at my disposal as much of the State Draft machinery as I needed.

On October 12th, a letter addressed to the Dentists of the State from the Surgeon General's office appealing to their patriotism together with instructions and return cards were sent to the Dentists of Rhode Island. A copy of each is attached and made a part of this report.

The selected men of the State, not already called, were then ordered to report for examination and treatment, if necessary, to the several dentists who had volunteered.

A record card with dental chart was sent to each drafted man to be given to the dentist, filled out and signed by him and mailed to the State Dental Director. As these cards were returned they were tabulated and forwarded to the Surgeon General's office. Many small details had to be worked out, grievances adjusted, complaints investigated and the like. A great deal of correspondence has had to be taken care of also.

You may be interested to know that the teeth and mouths of 866 men were put in first-class condition. There were 2518 fillings, 534 extractions, 495 cleanings, 57 crowns, 9 bridges and 1 X-Ray. A total of 3614 operations. All materials having been provided by the dentists themselves.

I wish it distinctly understood, gentle-

men, that this work has been accomplished at absolutely no expense either to the Government or to the men. It has been volunteer work entirely. The State Dental Director receives no salary or allowance of any kind, not even postage.

I have reason to believe that the results obtained during the next draft will be much greater than those of the first.

The mouths of the men have been found to be in a deplorable condition. Less than 6% of the men examined having teeth that did not need immediate attention.

Some of the men admitted the fact that the only time they visited a dentist was when a tooth severely ached and they must have immediate relief by extraction.

I have been reliably informed that before the volunteer dentists of our State began their work 14% of the men returned by the military authorities at Camp Devens was on account of dental defects; that since then none have been returned for such reasons.

You may ask why the Dental Surgeons of the Army cannot attend to the men. Congress allows but one Dental Surgeon to one thousand enlisted men and it is an impossibility for these few officers to attend to the temporary relief of the men, such as extracting, treating and the like, to say nothing of permanent work. Many of the Dental Officers are working from 7 A. M. to 10 P. M. daily. Congress has been asked to at least double the Dental Corps of the Army and it is hoped the bill will be passed.

Now is the time the volunteer dentists of our country can be of tremendous help and Rhode Island, in proportion to its size and number of men in the dental profession, will stand near the top of the list of States.

It is with real pleasure that I incorporate in this report the names of the 165 dentists of our State who have volunteered their services to their country and to the selected men of the National Army.

Arctic, H. L. Crepeau; Apponaug, F. P. McBride; Bristol, Howard N. Church, N. J. O'Brien William J. Tobin; Block Island, Robert H. Farnham; Natick, Charles Edward Callery; Narragansett Pier, Charles A. White; Newport, W. S. Greene, George A. Lynch, Howard Mathers, E. P. Robinson, Pascoag, B. A. Lynch, Thomas F. McPartlin; Pawtucket and Central Falls, R. M. Bannon, Louis P. Barolet, Waveland P. Bromley, Herbert N. Brown, James F. Clark, Charles R. Cole, P. E. Costello, Joseph A. Daudelin, Charles H. Davis, Fred A. Devanney, A. J. Fortier, Frederick D. Garland, R. W. Gatchell, James J. Gilheeney, F. B. Johnson, Earl B. Keighley, John B. LaFlamme, C. E. LaSalle, Hervery P. Lees, Noe J. Lugsier, E. L. Mason, Louis D. Millett, Joseph F. A. Nolan, Casimer E. Perrier, William F. Roberts, John I. Shattuck, Morse Wightman, Erle Wightman, Louis A. Wilbur; Providence, A. M. Aaronian, Courtland J. Allen, G. H. Ames, Ira O. Atwood, V. J. Baggott, C. W. Barlow, Herbert P. Beckett, S. Elie Berge, Orville T. Bliss, Jacob N. Blumenthal, Justin Boyce, William E. Braman, Leon R. Briggs, Charles C. Brown, John B. Browning, Jeremiah D. Buckley, B. Cecil Burgess, Eric H. Burgess, Thomas M. Canning, George W. Carpenter, Charles H. Casey, E. A. Charbonnell, John A. Clifford, J. P. Cooper, R. DeFoe, Angelo DeConti, Vincent De Conti, J. J. Dolan, James E. Doyle, George R. Drew, John J. Dwyer, George W. Elliott, H. S. Emirzian, Arthur P. Farley, William R. Fechney, D. E. Fennessy, Theophylo Ferreira, Deering J. Fisher, P. W. Fitzpatrick, L. D. M. Fuller, J. F. Gilbert, Frank P. Gleason, W. A. Greenleaf, H. A. Goodwin, Dr. Gordon, Harry I. Grant, Edward A. Haskell, Earl P. Hawes, C. F. Hayes, James E. Heap, F. A. Heffernan, Julius Irving, A. L. Jackson, C. V. Johnston, William N. Kiedder, J. H. Knowles, E. J. Leamy, Charles A. Clair, Louis Levy, Roland H. Lewis, Ernest L. Lockwood, Raymond A. Lundgren, James A. Lynch, Thomas E. McGreen, M. W. Maloney, Albert L. Midgeley, Louis C. Midwood, Arthur G. Mongean, Albert L. Morrison, F. Richard Mulhearn, Frank J. O'Donnell, Eli Paquin, Harry Parvey, Albert I. Pobirs, Arthur M. Potter, Harry Robertson, Walter C. Robertson, E. J. Roche, Wm. B. Rogers, Benjamin Rouslin, Clarence L. Roys, J. H. Russell, Nicholas J. Serror, A. E. Silveira, Raymond M. Smith, R. Stolworthy, Joseph A. Streker, Richard A. Sumner, Adin W. Taft, Frederick W. Thrift, Charles D. Winsor, I. S. Woiler, Thomas H. Yates, Riverpoint, Frank P. Duffy, Philip A. Duffy, Harry F. McKenna; Valley Falls, John I. Clark, Wakefield, Joseph N. Crandall, Arthur F. Lynch; Warren, Lawrence F. Gilleran, Louis R. Seymour; Westerly, James M. Crowley, Alexander Ferguson, Fremont Nye, A. H. Spicer, Jr., D. W. Stanton, Edwin Whitford Woonsocket, George W. Andrews, A. P. Cote, Robert L. Davis, Oscar P. Huot, Frederick G. Kuhl, James F. McNalley, Charles B. Maguire, Frederick L. Miller, J. N. Mowry, F. E. Powers, George A. Reichenberg, Stanislaus M. Rowen, Israel M. Shallen, Rudolph H. Vadenais.

In closing this report I wish to thank most heartily His Excellency, the Hon. R. Livingston Beeckman, Governor of Rhode Island, and Captain Geo. H. Webb, who have assisted me in many ways and the many dentists of the State who have performed the real work.

Respectfully submitted,
(Signed) WALTER R. McINTIRE,
Rhode Island Dental Director.

Jan. 19, 1918.

NOTES AND NEWS OF IMPORTANCE.

NEW MEMBERS.

The treasurer, Dr. L. M. Waugh, reports a most satisfactory response to the circular letter recently sent out as a means of recruiting members. A careful tabulation has shown that prior to January 1, 1918, there were, in round numbers, 5,700 members of the League. Up to February 1st, in response to the circular letter above mentioned, 4,900 new members have been enrolled, and Dr. Waugh reports that applications for membership have come in so rapidly, about a hundred a day, that as yet it has been impossible to classify by states. This will be reported next month.

THE LEAGUE BUTTON.

By a recently made rule, the buttons are to be sent to new members without extra charge. (Old members can get the button for 25c.) Therefore, members will please do two things: Get your button; **wear your button.** You are asked to wear it, not to advertise yourself, nor the League, but we want to make the man without a button conspicuous.

In France, within thirty days after the beginning of the war, all persons serving the government, soldiers, hostlers, drivers, railroad men, and labor of all kinds, skilled or unskilled, wore arm bands reading, "Military Service." Men without bands became very conspicuous, and received scant consideration from the "Women of France." Wear your League button!

All dentists who have not yet filled out Form 3A are requested to do so at once and mail the same to Lieut. Heckard.

DENTAL ANESTHETISTS WANTED.

My Dear Dr. Ash:—I am just in receipt of one of your circulars of the Preparedness League of American Dentists, and would sign up and return cards only I am a physician and surgeon, and I am furthermore disabled with arthritis from actively participating in your efforts.

However, despite my disability and the limitations of a wheel-chair, I am cooperating with the Surgeon General and Council of National Defense in recruiting expert anesthetists for immediate service at the front in the base hospitals and casualty clearing stations.

In this recruiting we have not drawn any lines between the surgical and dental anesthetist, believing that both are fully competent for this service. The interstate Association of Anesthetists, of which I am secretary, has welded the interests of the medical and dental professions so thoroly that recently in Ohio our Attorney-General, in an opinion, delegated equal privileges to medical and dental anesthetists. We are anxious to have the verdict of the war hospitals indorse this amalgamation.

It has been with some difficulty that we have persuaded the Surgeon General that anesthetists, surgical and dental, are in great demand at the front. To emphasize their value Capt. Gwathmey, of the Lakeside Unit, while loaned to the British Army, during the attack on the

Messines Ridge, kept three surgeons busy and standing at the head of three tables, radiating like spokes of a wheel, put 34 wounded soldiers under anesthesia during a period of five and one-half hours. Truly a record, and showing what the expert anesthetist can do in limiting the horrors of war.

The German, French and even the English anesthetic service collapsed promptly at the outset of the war, and thousands of wounded were operated on without anesthesia, agents and administrators both being lacking. We are trying to avoid such a collapse of our surgical and dental service.

In this connection, if in your canvass you encounter any dental anesthetists who desire active service, or who will accept anesthetic service at Base Hospitals at home, or are competent to act as instructors, or in replacing those in hospitals who have lost staff anesthetist to active service, let me have their names and addresses and I will try and see that they are given their chance of doing their bit.

Appreciating the efforts you are making and wishing you every success, I remain,

Cordially yours,

F. H. McMECHAN.

Avon Lake, Ohio.

DENTISTS ON MEDICAL ADVISORY BOARDS.

The Government has established a new and improved system of dealing with men who claim exemption because of alleged physical defects. What are known as "Medical Advisory Boards" have been formed, to which a man may appeal from the decision of a local Exemption Board, or to which the Local Board may refer doubtful cases. These boards, for convenience, are located mainly in conjunction with hospitals, and include high grade and skilled medical specialists.

Dentists have likewise been appointed to all of these boards. This is a recognition by the Government undoubtedly due to the services which have been rendered by the Preparedness League.

DENTAL PERSONNEL ON THE BOARDS.

The majority of the dentists appointed on the Medical Advisory Boards are already members of the League. However, State Directors are requested to obtain the list of such appointments, and if they find thereon anyone who is not a member of the League, a personal letter will probably induce such a man to join with us.

EXEMPTIONS FOR DENTAL DEFECTS.

From early indications the dental members of the Medical Advisory Board will have ample work to do. These boards not only examine cases of appeal, but also those cases where the Local Board examiners are in any doubt as to the physical disability of the registrant. The men are then classified as : "For general military service," "For limited military service," or exempt.

There has been a disposition on the part of the Local Boards to shift the responsibility for the dental cases, which will be partly overcome by the presence of dentists on these boards, otherwise the present number of dentists on the Advisory Boards will be inadequate.

The Selective Service Regulations admit of the broadest construction, and if taken literally, indicate that no man need be exempted because of defective or missing teeth.

SECTION 185. DENTAL REQUIREMENTS.

The person must have at least eight serviceable natural masticating teeth, either bicuspids or molars, four above and four below opposing, and six serviceable natural incisors or canines, three above and three below opposing. These teeth must be so opposed as to serve the purposes of incision and mastication. There must be one molar above and one

below on one side which occlude; the remaining six opposing masticating teeth may be either bicuspids or molars.

Teeth restored by crown or fixed bridge work, when such work is well placed and thoroly serviceable, are to be considered as **serviceable natural** teeth within the meaning of the above paragraph.

A well-fitting artificial denture, plate, or removable bridge is allowed to take the place of missing teeth, providing the **serviceable natural** teeth on one side of the mouth are sufficient to meet one-half the masticating (bicuspid or molar) requirements fixed above as the minimum.

If dental work will restore the teeth so as to meet the requirements outlined in the preceding paragraphs, the man should be accepted and sent to his cantonment, where the dental work needed to bring him within the requirements will be carried out.

DIFFICULTY OF INTERPRETATION.

Observe that in one place the regulation says that well fitting artificial teeth may take the place of natural teeth, provided that the natural teeth on one side of the mouth could sustain half the requirements of mastication. This is a little difficult to construe, especially as artificial teeth attached on one side alone constitute a more difficult problem in construction, than where attachment may be made on both sides.

The last paragraph of the regulation provides that if artificial teeth would bring the man within the requirements of the original standard the man may be accepted and sent to his cantonment and the work will be done there.

Already the medical members of the Advisory Boards are constructing this to mean that if artificial teeth can be made for a man, he may be accepted. If this be the meaning, then dental examination becomes useless because artificial teeth can be made for practically any man.

A closer study of the requirement, however, would seem to mean that **only one-half of a man's masticating apparatus may be restored by artificial teeth.** But if this is meant, the wording of the rule is unfortunate, since it seems to require that the restoration may only occur when the deficiency is on one side, which describes the least useful type of denture.

However, this is not the place to discuss this matter. It is mentioned here merely that the League may give the question intelligent study.

ORGANIZATION OF DENTAL MEMBERS OF BOARDS.

In New York City it has been decided, unless objections are made by the authorities, to form an association of the dental members of the Medical Advisory Boards. The first meeting will occur on February 18th. Members of the Adjutant General's staff will be present to give the dentists instructions as to the interpretation of the regulations. The final decision of some of the ambiguous features will be published next month for the information of all League Members officiating on Medical Advisory Boards.

LOCAL EXEMPTION BOARDS.

The Government will probably appoint at least one dentist on every Local Exemption Board in the country. If League members would serve on these boards, it would greatly facilitate the League's work, as in most cases the conscripted man could be directed at once as to where he could have his dental defects treated. Therefore Directors of States are urged to scrutinize all appointments to Local Exemption Boards, and to enroll all non-members within our ranks as rapidly as possible. It is desirable to appeal to the Adjutant General of your State and urge him to secure nomination for these boards thru the presidents and officers of local Boards.

R. OTTOLENGUI.

Army and Navy

DENTAL SOCIETY UNFURLS SERVICE FLAG.

The Englewood branch of the Chicago Dental Society, at their regular meeting on Tuesday evening, January 8, 1918, unfurled a service flag. This is the first instance, that we know, where a dental society has so recognized the patriotic men who have enlisted in active service in the dental corps. This society has established a commendable precedent—a precedent that we not only endorse, but urge other dental societies to follow. It is our duty, and we are sure will be our pleasure, to recognize in some way the patriotic devotion of our men who have gone out from our organizations to serve their country in this great crisis. The dedication of the service flag will have a tendency to create a sentiment, that will unify and inculcate a beautiful spirit of harmony and goodfellowship, which will mean a more permanent organization and a commendable recognition of Patriotic service to our country. —Editor.

At the regular meeting of the Englewood Dental Society, held Tuesday night, January 8, at the Strand Hotel, 6323 Cottage Grove avenue, a magnificent silk service flag was presented to the society by a few of its enthusiastic members in honor of its enlisted members.

Dr. J. P. Smith made the presentation speech. At this date the flag will contain fifteen stars representing the number of its members who have enlisted in the army and navy answering their country's call in defense of the high ideals and principles of democracy.

Among other prominent members present was Dr. Otto U. King, secretary of the National Dental Association who in commenting on the spirit of the occasion asked that the flag be photographed and given for publication in The Journal of the National Dental Association and added that this was the first society to show its respect to soldier members.

Other patriotic speeches were made by members of the society and the flag was officially accepted by the president, Dr. Ralph W. Becker.

Dr. Frederic R. Henshaw, of Indiana, Dean of the Indianapolis Dental College, gave the address of the evening.

The President of the society, Dr. Ralph W. Becker, introduced Dr. James P. Smith, who spoke as follows:

Mr. President, Members of Our Society and Guests:

I am not a member of any committee, so have no report to make but I have a little message to deliver to you this evening. If there were no other material reasons, the presence of these Army and Navy Officers this evening would convince me, I am sure, that it would not be

necessary for me to remind you that our country is at war. But I do feel that it is necessary for me to tell you that these boys are **our** boys and that we have reasons to feel proud of them, and to strongly impress upon your minds that we have some members of our Englewood Branch of the Chicago Dental Society who have gone, and are going, to take part in this great struggle for liberty and freedom.

We meet here once a month, enjoy a good dinner and the good fellowship which goes with it, after which we completely lose ourselves in the discussion of some good dental subject, quite forgetful of the fact that on the high seas and in foreign lands we have members of this society who are enduring hardships and risking their lives that mankind the world over may enjoy the same peace and liberties that you and I have always enjoyed and always expect to enjoy.

They have answered our country's call and have gone to the scene of action to help fight for the high ideals and principles of democracy. We must not forget this. At our meetings our thoughts and prayers should be with these boys and "least we forget," I have a little reminder —an antidote for forgetfulness—a reward for service, (a silk service flag is unfolded and tremendous enthusiasm follows) which a few of us wish to present to this society in honor of our Soldier members. Its significance is service, its colors are those of our United States—a country where men breathe freely of the atmosphere of freedom and liberty—what is more glorious and noble than one's service for one's country?

I will turn this flag over to our Secretary, Dr. A. G. Loomis, who will have charge of it and see that it hangs in some conspicuous place before us at our meetings. He has agreed to keep in his books a roll of honor with the military record of all our members who are engaged in this war and keep in touch with them to the best of his ability and as occasion warrants, let them know what we are doing.

This flag is graced with 15 stars which represents 15 commissions, or one-tenth of our entire membership. At the present time, however, only two have been called. One of these we will call Lieut. Wm. E. Coverly of the U. S. Navy. Will Lieut. Coverly please arise that we may see how he looks in his new suit? We wish you God-speed and hope your efforts will add materially to the efficiency of your men.

The other star we will call Lieut. M. M. Postle of the U. S. Army. Am sorry he could not be with us this evening. He sacrificed his practice, said good-bye to his wife and twin babies, took a spec-

ial course in plastic and oral surgery under the supervision of the government and will risk his life for the good of humanity. How is that for patriotism? May God give him strength and power to better enable him to perform his duties and return him safely to his wife and babies and to us.

The other stars represent as follows:

Lieuts. Milton Cruse, Frank Hospers. L. H. Jung, T. J. McCarthy, P. G. Papsdorf, F. E. Campbell, A. E. McKnight, C. H. Cass, K. C. Hudson, R. H. Marks, E. P. Hanrahan, George Manosevitch.

In you, gentlemen, we place our confidence. We will stand back of you and support you in every way possible, and in return it is only natural for us to expect that from these stars will radiate the most brilliant results of your service.

Short patriotic talks, fitting to the occasion, were made by Dr. John H. Hospers and Dr. George P. Halk, after which the flag was officially accepted for the society by its President, Dr. Ralph W. Becker, in the following well selected words:

"This is an occasion of which I am justly proud for it is the symbol of what is first and uppermost in our minds—the honor and integrity of our country and our flag.

"There is nothing nobler or greater than the admiration, esteem and love that men bear one toward the other and toward their country and I am sure that that was the spirit which prompted those who tonight have presented this service flag to this society.

"Dr. Smith, on behalf of the Englewood Society, I accept this emblem of loyalty and noble deeds. It will instill in all our hearts the inspiration of the privilege of service to our country and loyalty to those who have answered our country's call."

The unanimous standing vote of the society was extended to the donors of the flag.

UNCOMMON ARMY MEDICAL LEGISLATION.

Considerable attention has been attracted to a bill (H. R. 8937), introduced by Mr. Dyer, to amend section 1037 of the national defense act of June 3, 1916, and understood to have been suggested by Dr. Franklin H. Martin, chairman of the general medical board of the Council of National Defense. The bill provides "that the medical department of the Army shall consist of one surgeon general with the rank of major general, who shall be chief of said department; assistants surgeons general in the ratio of one-half of one per cent of the total number of officers of the medical corps provided by law, the assistants surgeons general to be equally distributed in the grades of major general and brigadier general, the medical corps, the officers' reserve corps," etc. It is further provided:

"That hereafter the President shall be authorized to fill any vacancies that may occur in the commissioned personnel of the medical department of the Army of the United States by ordering such officers of the medical section, officers' reserve corps, who shall have been in active service one year or more, to the Army Medical School under such rules and regulations as shall be prescribed by the Secretary of War, and such officers so ordered, upon completion and satisfactory examination, shall be commissioned in the medical corps, United States Army, and be entitled to all the pay, promotion, and allowances of officers of like rank in the Army of the United States, etc."

It will be observed, in the first place, that some of the "assistants surgeons general" will have rank equal to the head of the medical department and might even possess prior date of commission. It is the evident purpose of the author of the bill to make medical reservists, without regard to rank as such, eligible to appointment as "assistants surgeons general," altho there is carelessness in the phraseology, which provides that these officers, after the prescribed qualification, "shall be commissioned in the medical corps," whereas the surgeon general and the "assistants surgeons general" are not, according to the terms of the bill, of the "medical corps," but distinctly a part of the "medical department." It is probable, however, that, if the measure were enacted in its present form, there would be an interpretation of the law as the intention of Congress that the medical reservists who qualify as "assistants surgeons general" were to be commissioned in the "medical department."—*Army and Navy Register, February 16, 1918.*

AUTHORITY AND RANK FOR SURGEONS.

The War Department is giving consideration to a proposal for increased definite authority for medical officers, as well as the suggestion that there be a greater number of high ranking surgeons in the military-naval personnel. Mr. Baker is not in favor of additional legislation to meet the latter need, basing his objection on the circumstance that existing law permits the President to appoint, with senatorial confirmation, any number of medical officers to the grade of brigadier general and above, and he has informed congressional advocates of the proposed legislation that this will be done to an extent that is found to be justified by the exigencies of the service and in the interest of an effective administration of the medical department in the field during the present war. He has given no intimation of what he favors in this direction. As to increase of authority of medical officers, Mr. Baker, candidly admits perplexity, being confronted with the representations of the surgeons in favor of the plan on the one hand and with the warnings of the line officers against it on the other. The latter point out the necessity for maintaining and protecting the right of command, with which nothing should be permitted to interfere, less the success of a military movement be jeopardized. The secretary fully appreciates the necessity of giving medical officers as much power as possible in the exercise of their duties for the protection of the health of the troops, upon so much depends for the efficiency of personnel. The medical officers are, of course, making no claim for military authority, but they insist that responsibility shall attach to those who exercise authority. Mr. Baker also realizes the difficulties and dangers of making any hard and fast rule that shall run counter to the right of military command, and he is inclined to prefer the adoption of such regulations as will afford the medical officers abundant opportunity for the discharge of their exacting duties, restricted, however, to recommendations that commanding officers shall be admonished to approve and adopt unless it shall appear that there would be interference with, and menace to, the military control of a situation. — *Army and Navy Register, issue Feb. 9.*

THE CANADIAN ARMY DENTAL CORPS PERMANENTLY ESTABLISHED.

In a recent issue of the Dominion Dental Journal appeared an editorial which stated that the Canadian Army Dental Corps was on a war establishment only. In other words, as soon as the war closed, the dental corps would come to an end. Thanks to Union Government, General Mewburn, and the energies of some of the dental officers and the profession, a general order was passed making the establishment permanent. The Canadian profession has just cause for pride in the standing given it by the new order. The appended establishment is for Canada, and has nothing to do with the overseas establishment:

ESTABLISHMENT.

G. O. 101, 1917, Canadian Army Dental Corps, C. E. F., in Canada.

Headquarters.

Lieut.-Colonel (Director Dental Services)	1
Hon. Captain and Quartermaster	1
Staff Sergeant	1
Orderly Room Sergeants	2
Quartermaster Sergeants	1
Corporal	1

Military Districts.

Lieut.-Colonels	6
Majors	12
Captains (Military Districts Nos. 1-13)	76
Lieutenants (Military Districts Nos. 1-13)	39
Honorary Lieutenants (Military Districts Nos. 1-13)	10
Sergeant Major	1
Quartermaster Sergeants	10
Mechanical Sergeants	121
Corporals	10
Privates	123

Appointments to Units.

One Dental Surgeon to every 500 men in the District, and one or more Dental Surgeons, as circumstances may require, is to be attached to District Staff, and whose services are to be utilized in connection with units whose numbers do not reach the requisite number to permit of a Dental Surgeon being appointed to them.

Convalescent Homes.

One Dental Surgeon to every 150 beds.

Military Hospitals.

One Dental Surgeon to every 500 beds (with Mechanical Sergeant and Privates).

Note.—Dental Surgeons who have practiced their profession for two years or more are to be appointed with the rank of Captain; those under two years, with the rank of Lieutenant.

Lieutenants who have been in the Corps for one year may be promoted to the rank of Captain.

Dental Surgeons for Convalescent Homes will be exclusive of establishment provided above.

(H. Q. 3361-1-4, Vol. 2.)

—*Editorial Dominion Dental Journal.*

ARMY MEDICAL CORPS PURCHASES.

Purchases of all material of a medical and surgical character for the Army medical department will be concentrated under one officer, Colonel Carl R. Darnall, on duty in the surgeon general's office, who will have as his assistant Lieutenant Lawrence Lang, of the National Army, recently commissioned, and a civilian expert who has been attached to the purchasing branch of the office. Other officers will be in charge of inspection, transportation, and statistics, with the result

that there will be a centralization of the function of obtaining bids and awarding contracts and passing upon material before delivery. By this means it will be possible to transfer to the central purchasing office in Washington the work which has hitherto been divided between similar offices maintained at Atlanta, San Antonio, Chicago, Louisville, and San Francisco. The only exception to this purchase system will be that of the material needed by the gas mask division, where the type of mask and the material used in connection with it are matters of constant revision.—*Army and Navy Register.*

OUR SURGEONS IN FRANCE.

How American surgeons in France are operating at the front in rooms shaken by bombs from German aeroplanes told in a letter to his Missouri home from Joseph Wallace McKey, a student surgeon with the Washington University base hospital corps in France:

"I was selected as an anesthetist for an operating team at the front. We left in an ambulance and traveled all day thru Northern France.

"Our drivers were not quite sure where they were going and before long we found ourselves in Arras, which was the center of one of the biggest battles last spring. It was entirely shot to pieces and uninhabited. We stopped outside the town—completely lost. The driver started on, however, and came near going too far. We got close up to the trenches. "Next day we traveled all day along the northern battle front. We stopped at Vimy Ridge and saw the ground which the Canadians fought so hard to take. We got a fine view of Lens and could see shells bursting over the town.

"Finally we arrived at our destination —a field hospital—and started work. I was on duty each day from 9 o'clock at night until 11 o'clock next morning and gave many anesthetics. I saw some pretty radical surgery. From our tents we could see the observation balloons all along the line, and the guns kept up a constant roar. It was during one of the biggest pushes in the Battle of Flanders, and at night the horizon was aflame with flashes of the artillery.

"German airplanes came over on bombing expeditions regularly and got pretty close to us. Some of the explosions shook the operating theaters terribly."—*Army and Navy Register, issue Jan. 26, 1918.*

TRAINING MEDICAL PERSONNEL.

Plans are being made in the office of the surgeon general of the Army for adding materially to the medical training establishment at Fort Oglethorpe, Ga., in order that, in addition to the military and professional training and instruction that heretofore has been given to members of the medical reserve corps, corresponding courses may be conducted for other classes of the personnel of the medical department of the military establishment. It is planned to conduct courses for dentists, members of the sanitary corps, and veterinarians and for the enlisted person-

nel of those branches. Some work in the way of temporary building and installation of other additional facilities will have to be done before the courses begin, and their commencement depends largely upon the time of completion of the work. The course for the dental personnel will cover a period of about two months, one month being devoted to military instruction and one to professional. The professional instruction will be in charge of a member of the regular dental corps, who will be assisted by several members of that corps and of the dental reserve corps, and these officers soon will be selected. Each class will include about 165 officers and the same number of enlisted men intended for service as dentists' assistants. All those recently appointed to the regular dental corps will be ordered to take the instruction, and a sufficient number of members of the dental reserve corps will be sent to make up the allotted commissioned number of the class. Those subsequently appointed to the regular corps will be assigned to later classes. The surgeon general's office is in receipt from division surgeons and others many recommendations regarding eligibility for promotion of members of the dental reserve corps, but the reports from a number yet are to come in. Until all are received the surgeon general will not make up the list of proposed advancements for transmission to the Secretary of War for his approval.—*Army and Navy Register, issue Feb. 9.*

DENTAL CORPS ORDERS FROM WAR DEPARTMENT.

DENTAL CORPS.

Under provisions of an act of Oct. 6, 1917, advancement in rank of the following dental surgeons announced:

To be colonels, with rank from Oct. 6, 1917.—Robert T. Oliver, S. Davis Boak, Franklin F. Wing, Geo. L. Mason, Frank H. Wolven, John H. Hess, William H. Chambers, Alden Carpenter, Edwin P. Tignor, John A. McAlister, jr., Geo. H. Casaday, Julien R. Bernheim.

To be lieutenant colonels, with rank from Oct. 6, 1917—Rex H. Rhoades, George E. Stallman, George I. Gunckel, Frank P. Stone, Raymond E. Ingalls, Harold O. Scott, John R. Ames, Robert H. Mills, Frank L. K. Laflamme, Minot E. Scott, George D. Graham, Robert F. Patterson, Samuel H. Leslie, Albert R. White, Mortimer, Sanderson, John H. Snapp, Wm. A. Squires, Arnett P. Matthews, John W. Scovel, Charles DeW. Deyton.

To be majors, with rank from Oct. 6, 1917.—Benj. C. Warfield, Herman S. Rush, Lester C. Ogg, Harry M. Deiber, Lowell B. Wright, Walter L. Reescan, James G. Morningstar, Eugene Milburn, Claudius G. Baker, Samuel J. Randall, Charles Taintor, Don G. Moore, Oscar G. Skelton, Harlan L. Thompson, Robt. B. Tobias, Harry C. Peavy, Wm. S. Rice, Emmett P. Varvel, J. Craig King, Leigh C. Fairbank, Charles C. Mann, Richard B. Clark, Dale E. Repp, Terry P. Bull, Raymond W. Pearson, A. J. Skillman, Donald W. Forbes, James L. P. Irwin, Thomas C. Daniels, Ben H. Sherrard, Frederick R. Wunderlich, Wilfurth Hellman, Bruce H. Roberts, Samuel Kaufman, Lee S. Fountain, John L. Schock, Charles W. Lewis, Gerald D. Byrne, E. Henry Valentine, Oscar P. Snyder, Wm. Mann, Joseph H. Tyler, Rex McK. McDowell, Charles M. Taylor, Thomas L. Smith, Elbert E. Rushing, Earp T. Dickmann, Walter S. Smith, Brantley I. Newsom, George R. Tressel, Lee B. Schrader, Frederic H. Bockoven, Aaron F. Eidenmiller, Howard I. Benedict.

1st Lieut. Clement J. Gaynor from duty at Camp Funston, Kan., to Jefferson Barracks for duty.

Col. William H. Chambers from duty at Presido of San Francisco and report to commanding general, Western Department, for assignment to duty.

Col. Julien R. Bernheim from present duties to duty in office of attending surgeon, Washington, and in addition to that duty is placed in charge of dental service of District of Columbia, exclusive of Walter Reed General Hospital.

1st Lieut. William A. Moore from duty at Fort Bliss to Fort Bayard, general hospital, for duty.

Leave for 60 days granted Lieut. Col. George I. Gunckel on account of sickness.

—*Army and Navy Register.*

NATIONAL SOCIETIES.

National Dental Association, Chicago, Aug. 5-6-7-8 and 9.

National Association of Dental Faculties, Chicago, 1918.

National Association of Dental Examiners, Chicago, 1918.

Xi Psi Phi Fraternity, Chicago, 1918.

Psi Omega Fraternity National Alumni Chapter, Chicago, Aug. 5, 1918.

Association of Military Dental Surgeons, Chicago, 1918.

STATE SOCIETIES.

April.

Alabama—April 8, Montgomery.

Michigan—April 8-13, Detroit.

Kansas—April 15-16-17, Topeka.

South Dakota—April, Sioux Falls.

Texas—April 10-11-12, San Antonio.

Connecticut—April 18-19-20, Taft Hotel, New Haven.

West Virginia—April 10-11-12, Huntington.

Mississippi—April 16-17-18. Meridian.

Oklahoma—April 1-6, Tulsa.

Virginia—April 29, 30, May 1, Roanoke.

Pennsylvania — Golden Anniversary, April 23-24-25-26, Wilkes-Barre, Pa.

Missouri—April 1-3, Columbia.

May.

Indiana—May 21-22-23, Claypool Hotel, Indianapolis.

Iowa—May 7-8-9, Des Moines.

Massachusetts—May 1-2-3, Boston.

Nebraska—May 20-23, Lincoln.

Illinois—May 14-17, Bloomington.

June.

Kentucky—June 13-14-15, Lexington.

Wyoming—June 10, Thermopolis.

Georgia—June 12-13-14, Atlanta.

Maine—June 26-27-28, Portland.

New York—June 12-13-14, Saratoga Springs, N. Y.

Colorado—June 20-21-22, Estes Park.

South Carolina—Jefferson Hotel, June 27-28-29, Columbia.

North Carolina—June 19-20-21, Wilmington. Headquarters, Oceanic Hotel.

Florida—June 20-21-22, Atlantic Beach.

New Mexico—June 20-21-22, Albuquerque.

Arkansas—June 3-4-5, Little Rock.

July.

Wisconsin—July, Milwaukee.

New Jersey—July 17-19, Atlantic City.

Porto Rico, July, San Juan.

California—July 8-13, San Francisco.

November.

Arizona—November 15-16-17, Phoenix.

Washington, D. C.—Nov. 6, Chamber of Commerce, Washington, D. C.

District of Columbia—Nov. 20, Washington, D. C.

December.

Ohio—Dec. 3-5, Columbus.

Maryland—Dec. 15, Baltimore.

NORTH CAROLINA DENTAL SOCIETY

The North Carolina Dental Society meets June 19-21, 1918, headquarters Oceanic Hotel, Wilmington, N. C.

W. T. MARTIN, Secretary.

MICHIGAN STATE DENTAL SOCIETY.

The sixty-second annual meeting of the Michigan State Dental Society will be held at the Hotel Statler, Detroit, week of April 8-13, 1918. The regular meeting will be held on April 8-9, with a splendid program. The remainder of the week will be a Post Graduate Meeting in charge of the Detroit Club Clinic, at which every important branch of Dentistry will be covered.

C. G. BATES. Sec'y,
Durand, Mich.

MISSOURI STATE DENTAL ASSOCIATION.

The Fifty-third Annual Meeting of the Missouri State Dental Association will be held at Columbia, Missouri, April 1-2-3. A splendid program is in preparation, and great things may be expected.

J. F. WALLACE, Sec'y,
Canton, Missouri.

IOWA STATE DENTAL SOCIETY.

The fifty-sixth annual meeting of the Iowa State Dental Society will be held in Des Moines, Iowa, May 7-8-9, 1918. An excellent program has been prepared, including seminars, papers, and clinics. A cordial invitation is extended ethical members of the profession from out of state, to attend any or all of these sessions.

E. R. SWANK, Secretary,
Panora, Iowa.

PENNSYLVANIA STATE DENTAL SOCIETY.

The Golden Anniversary Meeting of the Pennsylvania State Dental Society will be held in Wilkes-Barre, April 23, 24, 25, 26, 1918. Excellent talent has been secured for this occasion and the program extended to a four days' session. To judge by preliminary reports of committees, this event promises to be the greatest meeting in the history of this organization. All ethical practitioners are cordially invited to attend.

J. F. BIDDLE, Secretary.
517 Arch St., Pittsburgh.

KENTUCKY STATE MEETING.

The next annual meeting of the Kentucky State Dental Association will be held at Lexington, Ky., June 13-14-15, 1918. An Amalgam program of special interest. Address all correspondence to Dr. W. M. Randall, Sec'y., Louisville, Ky.

CONNECTICUT STATE DENTAL ASSOCIATION.

The fifty-fourth annual meeting of the Connecticut State Dental Association will be held at the Hotel Taft, New Haven, Connecticut, April 18th, 19th and 20th, 1918.

GEO. S. LEONARD, Sec'y.

TEXAS STATE DENTAL SOCIETY.

The Thirty-eighth Annual Convention of the Texas State Dental Society will be held at San Antonio, Texas, the famous City of the Almo; April 10th, 11th and 12th, 1918. Members of other State Societies are cordially invited to attend.

J. G. FIFE, Sec'y,
736 Wilson Bldg., Dallas, Tex.

VIRGINIA STATE DENTAL ASSOCIATION.

The Virginia State Dental Association will hold its next annual session at Roanoke, Virginia, April 29, 30 and May 1, 1918.

An unusual program is being prepared and cordial invitation is extended to all ethical dentists to attend this meeting.

F. R. TALLEY,
Petersburg. Va., Corresponding Sec'y.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA.

The Thirty-seventh Annual Meeting of the Odontological Society of Western Pennsylvania will be held in the Hotel Chatam, Penn Avenue and Fourth Street, Pittsburgh, Pa., Tuesday and Wednesday, April 9th and 10th, 1918.

The Program Committee promises one of the best dental meetings ever held, men of note will read papers of interest to the Twentieth Century Dentists.

The clinics will be given by the Study Clubs of Western Pennsylvania and will be of interest to one and all.

Exhibitors will be amply accommodated with space by addressing Dr. Leslie Waddill, Jenkins Arcade Building, Pittsburgh, Pa.

DR. KING S. PERRY, Secretary,
719 Jenkins Building, Pittsburgh, Pa.

NORTHWESTERN ALUMNI HOMECOMING CLINIC.

The Northwestern University Dental School Alumni Association Homecoming Clinic will be held June 10th and 11th, 31 W. Lake St., Chicago.

Special features have been provided which will insure a successful and interesting meeting. Make your arrangements now to be in attendance. For information address,

DR. M. M. PRINZ, Sec'y,
4235 Lake Park Ave., Chicago, Ill.

CALIFORNIA STATE MEETING.

The California State Dental Association will hold its regular Annual Session for the year 1918 in San Francisco, July 8-13.

We will conduct our meeting this year on the Oklahoma Plan, and feel that we can assure all who attend a pleasant as well as a profitable meeting.

Further information may be obtained by addressing the Secretary: Dr. John E. Gurley, 350 Post St., San Francisco.

THE NEW YORK STATE DENTAL SOCIETY.

The 50th anniversary of the Den'al Society of the State of New York will be held at Saratoga Springs, New York, June 13, 14 and 15, 1918. The Society will endeavor to present a literary clinic and social program for the benefit of the profession in keeping with its Golden Anniversary. A cordial invitation is extended to all members of the National Dental Association. For further information, write

A. P. BURKHART, Sec'y,
52 Genesee St., Auburn, N. Y.

DENTAL LIBRARY ASSOCIATION.

Believing that one of the most important functions of a Dental Library is the interchange and exchange of dental books and journals, it has been thought advisable by a great many Dental Librarians to form a Dental Library Association, similar to the Medical Library Association.

Object:—The fostering of dental libraries and the maintenance of a system for exchange of dental literature and duplicates. Securing and distributing the Transactions of Dental Societies.

Membership:—Any Dental Society, Association, University, College or Library, having a fixed home and a Dental Library. Any individual interested in Dental Literature or Libraries.

Benefits:—The banding together of a united body with a common cause. The betterment of conditions in Dental Libraries. A Clearing House thru which books, journals, reprints, OR LISTS OF THESE, may be sent from one Library to another.

We desire to know what libraries now exist and how many would be interested in the formation of such a Society.

B. W. WEINBERGER,
Librarian, First District Dental Society, N. Y. Academy of Medicine,
or 40 East 41st St., N. Y. C.

NEW JERSEY STATE MEETING.

The forty-eighth annual convention of the New Jersey State Dental Society will be held on July 17-18-19, 1918, on Young's Million Dollar Pier, Atlantic City, N. J.

The entire convention will be held on the pier. Machinery Hall will be used for the exhibits. Those who attended last year will remember the magnificent display of dental goods and Dr. S. I Callahan of Woodstown, N. J., Chairman of the Exhibit Committee with 25,000 square feet of space available has promised an exhibit greater than that of 1917.

Machinery Hall Extension, with 10,000 square feet of space, will give ample room for clinics. Dr. Edward Stillwell, of Glen Ridge, N. J., is chairman of the Clinic Committee and has already arranged for a number of new and interesting clinics. This section will be of especial interest.

The Essay Committee, under the direction of Dr. C. M. F. Egel, of Westfield, will present two or three essayists of prominence whose names and subjects will be announced later.

All meetings for the presentation of papers as well as the business meetings will be held in the Greek Temple. This is a delightfully cool spot half way out on the pier.

The headquarters of the Society will be at the Pier entrance. Mail may be directed to Exhibitors, Clinicians, or members in care of the Secretary, New Jersey State Dental Society, Young's Million Dollar Pier, Atlantic City, N. J.

A list of hotels where special rates may be secured will be published in the New Jersey Dental Journal prior to the convention or may be secured by addressing the secretary.

A cordial invitation is extended to ethical practitioners.

JOHN C. FORSYTH.
430 East State Street, Trenton, N. J.

MASSACHUSETTS DENTAL SOCIETY.

The fifty-fourth annual meeting of the above named society will meet in the Massachusetts Charitable Mechanic Association building on Huntington avenue, Boston, Mass., Wednesday, Thursday and Friday, May 1st, 2nd and 3rd, 1918.

WALDO E. BOARDMAN,
Chairman Ex.-Committee.

NORTHERN OHIO DENTAL ASSOCIATION.

The annual meeting of The Northern Ohio Dental Association will be held at Toledo, Ohio, June 6th, 7th and 8th.

C. W. CLARK, Sec'y.

MAINE DENTAL SOCIETY.

The annual meeting of the Maine Dental Society will be held in the City Hall, Portland, Maine, on June 26-27-28. A splendid program is in preparation and great things may be expected.

J. E. PENDLETON, Secretary,
Lewiston, Maine.

WEST VIRGINIA STATE BOARD OF DENTAL EXAMINERS.

The annual examination of candidates for West Virginia State license to practice, will be held at Parkersburg, W. Va., June 25, 26 and 27, 1918. Blanks and information will be furnished on application to the undersigned.

H. H. SMALLRIDGE, Secretary.

MISSISSIPPI STATE MEETING.

The Forty-third annual meeting of the Mississippi State Dental Association will occur in Meridian April 16-17-18, 1918, at which time the officers of the Society unite with the Meridian members in promising a most instructive and enjoyable meeting.

W. C. DENNIS, Secretary.

SOUTH CAROLINA STATE MEETING.

The annual meeting of the South Carolina State Dental Association will be held at the Jefferson Hotel, Columbia, S. C., June 27-28-29.

Respectfully yours
ERNEST C. DYE, Sec'y.
W. BUSEY SIMONS, Pres.

OKLAHOMA STATE DENTAL SOCIETY.

The 1918 meeting of this society will be held in Tulsa, Oklahoma, April 1, 2, 3, 4, 5, 6. The plan for this meeting is a radical departure from the usual method of conducting State dental society meetings.

Our membership is being divided into classes and each class will take up the study of some particular subject for one week, under the supervision of a competent teacher.

At this writing classes are assured in the following subjects with the teachers named in charge.

X-Ray—Root Canal and Focal Infections—Dr. Elmer S. Best, Minneapolis.

Nerve Blocking—Anesthesia—Dr. Arthur E. Smith, Chicago.

Operative Dentistry—Crown and Bridge Work—Dr. James Mark Prime, Omaha.

Full Dentures—Dr. Rupert Hall, Chicago.

Partial Removable Dentures—Dr. F. Ewing Roach, Chicago.

Training Lady Assistants—Iva M. Hover, Omaha.

There also will be a general lecture course for those who do not desire to enter any of the special classes. This will be limited to three days.

A large clinic is being organized and the members of each class will be expected to do a certain amount of practical work in order that they may acquire a working knowledge of the technical teachings.

The membership of each class will be limited to a certain number. A special fee of twenty-five dollars will be charged the members of each class, except for dental assistants and lecturers only, which will be five dollars.

Dentists in good standing in their state society, outside of Oklahoma, desiring to attend this meeting should communicate with DR. C. R. LAWRENCE,
Enid, Okla.

MASSACHUSETTS STATE MEETING.

The fifty-fourth annual meeting of the Massachusetts State Dental Society will be held in Boston on May 1, 2 and 3, 1918.

J. ARTHUR FURBISH, D. M. D.,
400 Marlboro St., Boston. Secretary.

INDIANA STATE BOARD OF DENTAL EXAMINERS.

Next meeting of the Indiana State Board of Dental Examiners will be held at the State House, Indianapolis, June 17-22 inclusive. Applications and other information may be obtained by addressing H. C. McKittrick, Secretary, Indianapolis, Ind.

MEETING OF NEW JERSEY STATE BOARD OF REGISTRATION AND EXAMINATION.

The State Board of Registration and Examination in Dentistry of New Jersey will hold their annual meeting and examination in the Assembly chamber, at the State House, Trenton, N. J., on June 24, 25, 26, 27, and 28, 1918. License fee $25; re-examination fee $10. Practical tests required. Insertion of an approximal gold filling, with approximating tooth in position, compound approximal amalgam filling, a silicate filling, practical test of the applicant's ability in oral prophylaxis, and preparation of a cavity for an inlay with wax pattern. Also the soldering of a bridge consisting of three or

more teeth, exclusive of abutments, and one Richmond crown, which may be one of the abutments of the bridge; these must be made of gold or silver. The bridge must be struck from dies made from an impression of the mouth, and the articulating model, with the bridge, when soldered, must be submitted for inspection. An anatomical articulation of a full upper and lower set of teeth will also be required; teeth to be furnished by applicant. Wax bite properly trimmed and in place on models for inspection before setting up teeth.

Attention is directed to the following quotation from the dental law of New Jersey: "Applicant shall present to said board a certificate from the commissioner of education of this state, showing that before entering a dental college he or she had obtained an academic education consisting of a four-year course of study in an approved public or private high school, or the equivalent thereof." In accordance with this law the secretary will issue application blanks only upon presentation of the required certificate from the commissioner of education, State House, Trenton, N. J.

Applications must be filed complete ten days before the date of the examinations. Address all communications for further particulars to

JOHN C. FORSYTH, Sec'y,
430 East State St., Trenton, N. J.

SOUTH CAROLINA STATE BOARD.

The annual meeting of the Board of Dental Examiners in the State of South Carolina will be held at The Jefferson, Columbia, S. C., beginning promptly at 9 o'clock Monday morning, June 24th, 1918.

All applications must be in the hands of the Secretary by June 14th. Application blanks and full information may be obtained by addressing

R. L. SPENCER, Sec'y,
Bennettsville, S. C.

NEW MEXICO STATE DENTAL SOCIETY.

The next annual meeting of the New Mexico State Dental Society will be held at Albuquerque, New Mexico, June 20-21-22, 1918.

J. J. CLARKE, Sec'y,
Artesia, N. M.

ARKANSAS STATE MEETING.

The thirty-first annual meeting of the Arkansas State Dental Association will be held in the Hotel Marion, Little Rock, Ark., June 3-4-5, 1918.

H. J. CRUME, Sec'y,
Hamburg, Ark.

DR. G. C. JERNIGAN, President,
Rector, Arkansas.

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